

# Invasive Insects on our Radar in Southwest BC

Tracy Hueppelsheuser B.C. Ministry of Agriculture

May 2, 2018 Lillooet Invasive Species Society

### Ministry of Agriculture

# Outline

- Introduction on invaders
- What is plaguing BC agriculture?
  - True Armyworm: 2017 Outbreak
  - Western Corn Rootworm: Range expansion
  - Spotted Wing Drosophila: Update
- Pests to watch out for:
  - Brown Marmorated Stink Bug: New to North America and BC
  - Japanese Beetle: incursion into Vancouver



Center for Invasive Species Research

# http://cisr.ucr.edu/

- 9 new invasive arthropods establish each year in California
  - 84% are insects, 8% mites, 3% spiders
  - Up from 6/ yr prior to 1990.
- Not all become pests: estimate 20% do
- Invasive pests cost California \$3-6 billion/year
   Many new species to BC come up from initial introductions in California.....

# Canada has a long history of non-native introductions

- > 1440 non-native species have invaded Canada's forests, agricultural & aquatic systems<sup>1</sup>
- Earliest record is codling moth in Ontario in 1635<sup>2</sup>
- 419 non-native insects and mites reported on woody plants<sup>2</sup>

<sup>1</sup> Colautti et al. 2006. Biol. Invasions
 <sup>2</sup> Langor et al. 2009. Biol. Invasions

Slide From: G. Zilahi-Balogh, T. Kimoto, L. Shields, D. Holden, Canadian Food Inspection Agency Rate of Invasive Introductions: On the increase because:

- $\uparrow$   $\uparrow$  volume of trade
- transportation
  time
- ↑ ↑ tourism & other travel
- ↑ ↑ access to international markets



~ 4200 vessels called on BC ports in 2009



Slide From: G. Zilahi-Balogh, T. Kimoto, L. Shields, D. Holden, CFIA

Brown Marmorated Stink Bug Halyomorpha halys Family: Pentatomidae

- New to North America and to British Columbia;
  - native to China
- Not regulated
- Hitch-hiker
  - moves on conveyances and often non-plant material

### **Brown Marmorated Stink Bug Hosts**

- **Hosts:** very broad, fruit and vegetables (<300 hosts):
  - Vegetables: legumes, peppers, tomatoes, corn, soybeans, snap beans.
  - Fruit: apples, peaches, figs, mulberries, citrus, persimmons, berries, grapes,
  - Ornamentals,
  - Weeds
  - Woody plants, trees



#### Damage to many fruit and vegetable crops



Brown marmorated stink bug external and internal damage to apple; damage to Asian pear. Photo Credit: apple damage Peter Shearer, Oregon State University.



Brown marmorated stink bug damage to peppers, tomatoes and corn. Photo credit: Galen Dively, University of Maryland

White bands  Adults present: over winter and spring. (one generation per year)
 Eggs June, July
 Nymphs present from July onwards
 New adults: late August-Sept

Nymphs and adults will aggregate at feeding sites, i.e. on fruit





**Underside of male and female BMSB:** they are pale, white, pinkish, orange.

> NEVER green or brown underside

#### 2016 Brown Marmorated Stink Bug confirmed locations



Kitsilano, Chilliwack Mountain, Rosedale: all urban locations

#### Brown Marmorated Stink Bug confirmed locations



: Kitsilano, Chilliwack Mountain, Rosedale: all urban locations

: East Vancouver, Burnaby, Coquitlam, Maple Ridge, Langley, Mission, Abbotsford, Sumas WA, Chilliwack, still urban and semi-urban locations.

# Tools for monitoring:

• Trapping

• Watch for Damage



# What's next?

• Watch for BMSB **in crops**, presence and any damage to fruit.

**Growers:** *please report any suspect bugs* 



#### Brown Marmorated Stink Bug (BMSB) Pest Alert

Brown marmorated stink bug (*Halyomorpha halys*), a native pest of Asia, was first identified in North America in Pennsylvania in 2001. It has since spread throughout most of the United States. It is a very serious pest that feeds on more than 100 different plant species. In 2010, an estimated loss of \$37 million due to brown marmorated stink bug feeding was reported by the apple industry in the Mid-Atlantic States.

The stink bug is an excellent hitchhiker and can be moved in shipping containers, wood, packing material, cargo and vehicles. It is also a nuisance to homeowners as the adults aggregate on and in buildings while seeking warm overwintering sites.

Brown marmorated stink bug was first detected in British Columbia in 2015 and is present at low levels in urban areas of Fraser Valley and Vancouver, Brentwood Bay on Vancouver Island and the Okanagan Valley, as of October 2017. High numbers are present in the downtown Kelowna area. Growers and homeowners are asked to send pictures or samples of suspect brown marmorated stink bug to the B.C. Ministry of Agriculture offices or to contacts shown at the right.

#### Identification

Adult: Shield-shaped, 13 – 17 mm long, brown marbled appearance, alternating brown and white markings on the outer edge of the abdomen; can be distinguished from other stink bugs by the presence of distinctive white bands on the last two antennal segments (see adult picture on right). Adults may be confused with other native brown stink bugs and western conifer seed bugs.





#### **Report Suspect BMSB**

Please send pictures or samples of suspect brown marmorated stink bugs to:

#### Southern Interior

Susanna Acheampong Tel: (250) 861-7681: 1 888 332-3352 Susanna.Acheampong@gov.bc.ca

#### Lower Mainland

Tracy Hueppelsheuser Tel: (604) 556-3031, 1 888 221-7141 Tracy.Hueppelsheuser@gov.bc.ca

#### Identification & Management Information

- Brown Marmorated Stink Bug <u>Factsheet</u> - identification and management (PDF)
- Brown Marmorated Stink Bug -Brochure for Homeowners (PDF)
- Brown Marmorated Stink Bug Pest Alert Postcard (PDF)
- Controlling Brown Marmorated Stink

Controlling Brown Marmorat Stink Bugs in Your Home



THERE ARE HIGH NUMBERS of brown marmorated bugs in your neighbourhood and we anticipate these bu may be a nuisance when they start looking for warm pla in your home to spend the winter. Brown marmorated sl bugs release unpleasant odours when crushed or threat but they do not bite people.

#### WHAT YOU CAN DO:

Prevent entry into your home by sealing off any access points in your windows, doors and screens.

Vacuum bugs in and around your home, dump in a container of soapy water to kill them before disposal. TI

https://www2.gov.bc.ca/gov/content/industry/ agriculture-seafood/animals-and-crops/planthealth/insects-and-plant-diseases/treefruits/brown-marmorated-stink-bug Japanese Beetle Popilla japonica Family: Scarabaeidae

- Never been detected in British Columbia;
   native to Asia
- CFIA-regulated pest
- Hitch-hiker
  - moves on conveyances (cars, trucks) and possibly non-plant material
  - Larvae move in soil

### Japanese beetle trap used by CFIA

- Since early July 2017, over 800 beetles were caught, 88% in David Lam Park on the north side of False Creek in Vancouver.
- The rest were all caught within a few hundred meters



Sign



### Japanese Beetles: adults feed on foliage (August 5)





- Adult beetle's favorite plant in David Lam Park: *Persicaria*
- In Knotweed family

Close up of feeding on leaf by beetles



# Larval Damage

- Feed on roots reducing the plants intake of water and nutrients
- Patches of brown dead grass, may feel spongy and be easily pulled away





Slide from CFIA Plant Health Survey Unit

# Adult Beetle Hosts Over 300 species attacked



## **Attacks**

Ornamentals
Nursery stock
Tree fruit
Small fruit
Field crops

Persicaria sp.

And other Polygonaceae

## **Commonly Attacked**

- Japanese Maple
- Norway Maple
- •Prunus spp.
- •Malus spp.
- •Grape
- Small Fruit
- Virginia Creeper
- •Rose
- •Elderberry
- Rubus spp. i.e. Blackberry

# Larval Hosts

- Wide variety of plant roots
  - ornamental, shrubs, garden crops
- Preferred turf grasses
  - Kentucky Bluegrass
  - Perennial Ryegrass
  - Tall Fescues
  - Bentgrass

(David Cappaert, Michigan State University, Bugwood.org)

# Path Forward

- Enhance public awareness to help improve detection
- Containment and Eradication in 2018
  - 1. CFIA Green waste movement control in Vancouver
  - 2. Some City and private lands to be treated for larvae around False Creek

Goal: to stop the spread or eliminate the pest from Vancouver so it never reaches farmland

# What can you do?

- If you find the beetle?
- If you see adult damage?
- If you see larval damage?



 Please call CFIA Japanese Beetle Hotline at 604-292-5742

http://inspection.gc.ca/JB

# http://www.inspection.gc.ca/plants/plant-pests-invasive-species/insects/japanese-beetle/eng/1328048149161/1328048244390

### Japanese Beetle – Popillia japonica (Newman)

#### Reporting Japanese Beetle in Vancouver

If you think you have found Japanese beetle in Vancouver, please report it to the Canadian Food Inspection Agency.



Japanese beetle is a plant pest native to Japan that attacks roots, foliage and fruit of a variety of host plants, including elm, maple, rose, zinnia, corn, asparagus, grape, apple, blueberries, raspberries and blackberries. The Japanese beetle larvae favour turf grass as their host material, while adults feed on the leaves and fruit of a wide variety of host plants.

#### What information is available?

- Questions and Answers
- Facilities Approved for the Japanese Beetle Program
- Pest Fact Sheet
  - Regulatory Status of Areas in Canada and the United States
- Policy Directives
  - D-96-20: Canadian growing media program, prior approval process and import requirements for plants rooted in approved media

#### Plant Pest Credit Card: Japanese beetle

PDF (1,452 kb)



## True Armyworm Mythimna (=Pseudaletia) unipuncta

Native to North America

No known outbreak on west coast

- Not regulated
- Migratory insect
  - Moves on winds ('low level jet stream')
  - May establish in temperate areas if climate allows

### Prone to outbreaks every 5-20 years- *difficult to predict*



### Life cycle of True Armyworm Mythimna (=Pseudaletia) unipuncta Family: Noctuidae



# Life stages: Adult True Armyworm moth



When small (under ¾ in) armyworm larvae can be light coloured, and blend in very well with grass blades

In about 3 weeks, depending on temperature, they will get bigger and hungrier:

### Armyworm larvae (caterpillars)

In about 3 weeks, depending on temperature, larvae continue to get bigger and hungrier:

90% of the food they consume is in the last 2 weeks before pupation—and when most of the crop damage is done.



Larvae at base of grass plants and their frass (excrement) pellets

Larvae on corn leaves

### Ministry of Agriculture

# Pupation occurs near or on surface of soil

Pupae not unique: similar to other noctuid species

### Historical distribution of True Armyworm in B.C.



Royal BC Museum, and Spencer Entomological Collection, Beaty Biodiversity Museum, UBC

### Ministry of Agriculture


#### **First generation:**

# Damage was extensive in Vancouver Island grass hay crops June, July



Leaf blades eaten

Extreme defoliation in shady areas along trees

#### Second generation was worse: Damage: Hay and Corn (late Aug-Sept) Both Vancouver Island and Fraser Valley



# Biological control agents

- Many parasites, predators, and diseases of Armyworm
- Many are generalists
  - Bios can cause significant reductions in pest populations, and keep the pest in check in non-outbreak years
  - Cannot prevent outbreaks
  - They do 'take the edge off' after a year or two, and some will crash outbreak populations (virus infections)
  - Multiple agents work together

A good reference is: "Field Crop and Forage Pests and Their Natural Enemies in Western Canada"

Government of Canada publication, 2015



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I Agriculture et ada Agroalimentaire Canada Floate, K.D. 2017. Cutworm pests on the Canadian Prairies: Identification and management field guide. Agriculture and Agri-Food Canada, Lethbridge, Alberta.



http://www.saskcanola.com/quadrant/media/files/resource/ pdfs/Cutworm-booklet-Final-EN-May1-2017.pdf

# **Cutworm Pests of Crops on the Canadian Prairies**

IDENTIFICATION AND MANAGEMENT FIELD GUIDE

## Some bios from 2017



- Carabid beetles: predators
- Parasitic wasps killing armyworm larvae



# Some bios from 2017



- Parasitic fly (tachinid) kills larvae
- Parasitic wasps killing armyworm pupae



# Look-alike species:

- Grass feeders and climbing cutworms
- Noctua pronuba: Winter cutworm, Large yellow underwing



Peridroma saucia
 Variegated cutworm



# Look-alike species:

• *Dargida procinctus* Olive Green Cutworm



 Spodoptera praefica, Western yellow-striped armyworm







Google image search



#### Some similar looking soil-inhabiting insects:



Leatherjacket larvae

Armyworm larvae

Wireworm larvae

### Management for True Armyworm

- Good field vigor and health is best preventive approach
- Monitor/scout:
  - June-Sept
  - If over threshold there will be damage: *5 larvae/sq ft*

- Management
   Options:
  - Fertilize and water the fields
  - Foliar insecticides
  - Harvest or graze early



# What's next with Armyworm?

- There is a need for Research on Biology of this BC population of True Armyworm:
  - There is almost no published information about this pest west of the Rocky Mountains.
- Monitor in 2018: Pheromone traps for adults, scout for larvae in fields: Area survey, Growers check their own fields, If over threshold, can take management steps
- 2. <u>Overwintering studies</u>: Will Armyworm overwinter in BC?
  - Emergence traps, lab trials
- **3.** <u>Origins of population</u>: Where do the immigrating moths come from?
  - Morphological assessment of spring and fall moths



## Western Corn Rootworm Diabrotica virgifera Family: Chrysomelidae (leaf feeding beetles)

- Native to North America
  - First "official" detection August 2016 on Sumas Prairie—no record of any previous presence
- Likely moved into B.C. by natural spread
- Several Diabrotica species exist,
  - so far B.C. has only this one



### Western Corn Rootworm (WCR) *Diabrotica virgifera*: North American distribution

 Major corn pest in mid west and eastern North America



Known to occur in

Diabrotica (Western and Northern Rootworms) estimated to cause over \$1 billion USD in yield losses and control costs (Mitchell et al 2002)

state data and Diabrotica articles

#### Life cycle of Western Corn Rootworm:



# Survey with Yellow Sticky Traps: July 25-Sept 15, 2017: along corn field edges, mostly field corn, some sweet corn

- Caught beetles the entire time.
- Highly variably catch from field to field





# Hosts

- Crops damaged by larvae:
   corn, all types
- Beetles will feed on any pollen source
  - Any mid summer flowers that happen to be near corn fields
  - cucurbits; melons, squash, or cucumbers in blossom are highly attractive



#### Rootworm beetles eating and aggregating squash flowers and leaves (August 8)









Silk snipping by feeding beetles (Aug 8)

may affect pollination and cob fill







Beetle feeding on leaves,

Extensive feeding looks like bleaching' (August)

# Larvae

- Hatch from eggs in early June.
- Dark head and tail, thin, long, 6 legs are evident
- Could be mistaken for wireworms
- Oldest larvae do the most damage: mid July onwards

Black spot on tail

# **Damage to Corn**

Rootworm larvae in corn roots, feeding on brace roots, late July

# Healthy roots vs larvae-damaged roots

For every node (ring of roots) with larval damage, estimate a 15% yield loss

## Corn falling over, July 24 2017









# Damage by rootworm larvae:

- drought stress,
- poor growth,
- variable growth in a field,
- lodging (July-Sept)

## Risk Factors for Corn rootworm in a field?

- History of seeing beetles in field
- History of lodging, goosenecking, variable or weak growth in field
   Moderate or High risk fields
- Over 3 years in corn
- Late planting
- Non-sandy soil (makes egg laying more successful)
- Known high populations of WCRW in area
  - central and eastern Fraser Valley had highest levels in 2017)

## **#1 is Crop Rotation:**

- Breaks the one-year life cycle of WCRW
- No other significant host plants for egg laying
  - Some other grasses can host young larvae
  - A population cannot be sustained on plants other than corn

# Next steps

- Continued outreach to industry
  - Pacific Agr Show
  - Industry meetings
- More survey in 2018
  - Tools for survey:
    - sticky cards for adults,
    - visual assessment of roots, leaves, silks
  - Look at field history, rotations, cropping practices
  - Local biology/ timing of life cycle



In partnership





Sticky traps for monitoring corn rootworm adults.

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farn	nwest.c	http://www.farmwest.com/			Pacific Field Corn Association			
Home	Advisories	Climate/Adaptation	Events	Farming Links	Library			
Home » Library » Articles								
Insects		Insects & Pests						
<ul> <li>Corn Producers Can Take Steps towards Reducing the Risk to F (2012)</li> <li>Dung Beetle</li> <li>EU says pest to bee declir restricted (2</li> <li>Ontario Bee Update (201</li> <li>Some Facts Bee Health a (2013)</li> <li>Using Degre Predict Inset Developmen</li> </ul>		Native Poilinators and Agriculture in Canada (AAFC 2014) Pest Degree Days to Predict Insect Development Rats! Black Rat spreads to BC Interior (2014) Rodents - Living with Wildlife in BC (2014) Spotted Wing Drosophila (2016) True Armyworm 1. Information for BC Growers July 2017 True Armyworm 2. Update August 28, 2017 True Armyworm 3. Confirmed in Abbotsford Grass Hay Fields August 2017 True Armyworm 4. Pest Alert September 7, 2017						
<ul> <li><u>APPS for Agriculture</u></li> <li><u>Articles</u></li> <li><u>Crops</u></li> <li><u>Environment</u></li> <li><u>Insects</u></li> <li>Livestock</li> </ul>		<ul> <li><u>Corn Rootworm 2016.2 - Western Corn Rootworm Lifecycle</u></li> <li><u>Corn Rootworm 2016.3</u></li> <li><u>Corn Rootworm 2017.1 PEST ALERT!! Western Corn Rootworm in B.C. (Jan 2017)</u></li> <li><u>Corn Rootworm 2017.2 - Western Corn Rootworm Update January 2017</u></li> <li><u>Corn Rootworm 2017.3 - It's time to check your corn fields for rootworm damage so plans can be made for management/rotation</u></li> </ul>						

# Spotted Wing Drosophila Drosophila suzukii, Family: Drosophilidae

- Detected in California in 2008, and Abbotsford in Sept 2009, and spread around North America and Europe
- Origins: Asia, mainland China



# Spotted Wing Drosophila life cycle: 4 stages

Dispersal: pest is moved in infested fruit, or adults fly (natural spread)





SWD life cycle: 8-14+ days/generation, 3+ generations/yr in BC



Larvae develop in ripe fruit

Infested fruit is of poor quality and not marketable.



Fruit softens and collapses as larvae feed and grow in ripe fruit

# Over 129 hosts are recorded globally

berries and stone fruit both cultivated and wild





# Best Management Practices for SWD in Berries

- **1. Good field care:** decrease humidity, reduce fly feeding and breeding sites (prune, weed control, clean equipment, minimize cull piles).
- 2. Hedgerow management: are there good SWD hosts around your fields? Can blackberries be controlled?
- **3. Monitoring:** to detect SWD presence (e.g. traps for flies, fruit inspections for larvae). Consider the regional information and reports.
- **4. Well-timed sprays:** flies + ripe fruit = RISK
- 5. Harvest: picking on time, cool fruit quickly.

## **Forecasting: Winter trapping**

- Flies are active (flying) all winter in south BC.
- Anticipate how much risk to expect in the season
- We trap Dec-May each year in hedgerows outside berry fields



#### Cold days in winter kill SWD:

Coldest temperature and consecutive number of days below -1.6°C (lethal temperature for 75% of female SWD) measured at the Abbotsford Airport (Environment Canada), years 2010-2017

Year	Lowest daily minimum temp (°C)	Lowest daily maximum temp (°C)	Number of consecutive days below -1.6°C (calendar dates)
2010-2011	-10.9	-4.1	3 days (Nov 22-24, 2010)
2011-2012	-14.8	-9	2 days (Jan 18-19, 2012)
2012-2013	-7.7	-0.1	1 day (Jan 13, 2013)
2013-2014	-11.3	-3.4	4 days (Dec 6-9, 2013), 2 days (Feb 4-5, 2014)
2014-2015	- <b>9.2</b> (Nov 2014)	-2.3	1 day (Nov 29, 2014)
2015-2016	- <b>6.5</b> (Nov 2015)	+ <b>1.6</b> (Dec 2015)	No lethal days
2016-2017	-11.9	-4.8	<u>8 days:</u> Dec 7, 14, 15, 16, 17, Jan 3, 13, Feb 6
2017-2018	-6.6	-2.1	<b>3 days:</b> Dec 26, 27, Feb 21 71

#### Winter Trapping



Date of collection, 2 week intervals between checks


US

A Degree Day Model measures accumulation of heat

insect life stages can be monitored this way

<u>http://uspest.org/cgi-</u> <u>bin/ddmodel.us?spp=swd</u> OSU: Len Coop, Amy Dreves

#### <u>spotted wing Drosophila</u> [fruit] invasive insect model of <u>OSU vers. 3.0</u>

Output from <u>uspest.org/wea</u> invasive insect degree-day/phenology model program: Heat Units and predictions of key events from daily weather data

My receptible of S. seedd.



Annual Contraction



**Best Management Practices for SWD:** 

Pick early, Pick clean, Pick often Great sanitation, Short picking intervals, Careful fruit handling, Strategic sprays









Fig. 5 The number of eggs, undetectable larvae (1<sup>st</sup> and 2<sup>nd</sup> instars) and detectable larvae (3<sup>rd</sup> instars) per kilogram of raspberries when harvested daily, every 2 days, and every 3 days.

From Michigan Factsheet http://www.ipm.msu.edu/ uploads/files/SWD/MSU\_O rganic\_SWD\_factsheet\_De c2016.pdf Interval between picks and hang time is critical to prevent SWD population explosion:

From our local studies:

Comparison of SWD infestation levels at different hang times (Blueberry, var. Bluecrop)



# Field perimeter/border sprays

- Shown to be effective in organic blackberries (Iglesias & Liburd, Florida, 2016)
  - Outside 3 m of the field, sprayed 3 times in May (pyrethrins, azadiractin) when some fruit was already ripe







#### ORIGINAL CONTRIBUTION

#### The effect of border sprays and between-row soil tillage on Drosophila suzukii in organic blackberry production

L. E. Iglesias & O. E. Liburd

Entomology and Nematology Department, University of Florida, Gainesville, FL, USA



Outside 3 m of the field, sprayed 3 times in May (pyrethrins, azadiractin) when some fruit was already ripe.

Prevented a peak fruit infestation compared to untreated plots in June



# Cultivation between rows

- **Trend** of decreasing SWD flies and damage (Blackberries, (Iglesias & Liburd, Florida, 2016)
- Low humidity decreases survival of SWD (Tochen et al, Oregon)



### On ground: Humid vs less humid



http://www.omafra.gov.on.ca/english/crops/hort/news/hortmatt/2014/02hrt14a3.htm

## Ontario article: International Strawberry Symposium, Quebec, 2016:

http://www.omafra.gov.on.ca/english/crops/hort/ news/allontario/ao0616a1.htm **Ground cover**: weed mats: decrease humidity and increase heat, less amicable for SWD, Exposes pupae to predation and dehydration

(Walton, Tochen, Oregon; Renkema, Guelph & Florida)

#### Pruning, training, trellis :

important to limit humidity, increase air flow, ensure least- impact tractor passes,



# Netting

80 gram/m sq., 1.0 x 0.6 mm mesh size



Challenges are: Keeping the door closed Preventing holes and tears. Minimizing the humidity within. Costs of setting up and maintenance.

Works best: Small acreage Domestic/backyard

2013-2014 trial: 100% prevention of SWD infestation

### Netting: high tunnels



Fig. 6 Exclusion netting fitted to a high tunnel raspberry system, with doors to allow for sprayer access.

From Michigan Factsheet <u>http://www.ipm.msu.edu/uploads/fil</u> <u>es/SWD/MSU\_Organic\_SWD\_factshe</u> <u>et\_Dec2016.pdf</u> "We found an average reduction of 73% and a 4 week delay in SWD eggs, larvae, and adults in the netted high tunnels covered with 80 gram netting"



Fig. 7 The estimated cost to cover the perimeter of 1 acre of high tunnels (five 400ft tunnels) in 80 gram netting.

### **Biological Control for SWD**



The Good Fruit Grower <u>http://www.goodfruit.c</u> <u>om/drosophila-</u> parasitoid-found/

Rate of natural parasitism by generalists in North America: about 2% in collected fruit samples <u>Korean species is being evaluated in the USA</u> <u>quarantine facilities to see if good candidates for</u> <u>classical biocontrol releases</u>

#### www.swdmanagement.org

MAINE RITCER

Upcoming webinar on "SWD research & management in organic production", scheduled for 3pm EST on Tuesday Feb 27.

You can view information and register for that webinar here: <u>http://articles.extension.org/pages/</u> 74612/management-of-spotted-wingdrosophila-using-organically-approvedstrategies:-an-update

## "Good bugs vs bad: using biological controls in SWD management"

You can now view the recorded webinar online at the following links:

YouTube: <a href="https://youtu.be/h96K1UHhSps">https://youtu.be/h96K1UHhSps</a>

Berkeley

Via our project webpage: <u>https://swdmanagement.org/20</u> <u>18/02/view-the-webinar-good-bugs-vs-</u> <u>bad-using-biological-controls-in-swd-</u> <u>management/</u>

#### www.Spottedwing.org



#### About Spotted Wing Drosophila and the SCRI SWD Project

Spotted wing drosophila (SWD), Drosophila suzukii, is an insect pest of economically valuable small fruit and tree fruit crops. Known in Oregon and the Pacific Northwest since about 2009, this species now appears to be established in many fruit growing regions around the country. Growers and researchers are working together to implement effective pest control strategies.

Washington SCRI Project Bibliography Research Team Research Reviews Photos and Videos External Links

### Ministry of Agriculture

### **Questions?**

Tracy Hueppelsheuser <u>Tracy.Hueppelsheuser@gov.bc.ca</u> Office Phone 604-556-3031



Plant and Animal Health Branch B.C. Ministry of Agriculture Abbotsford Agriculture Centre 1767 Angus Campbell Road Abbotsford, BC V3G 2M3

8:30 A.M. to 4.30 P.M. Monday to Friday Call Toll Free: 1-800-661-9903