Spotted Wing Drosophila at Adam’s Berry Farm
Impacts, Observations and Management
Before...
And after
Impact over 3 years

• 2012
  70+ % loss

• 2013
  30% loss in managed field, 75% loss in unmanaged

• 2014
  Minimal loss due to management change-netting
ProTek 80 netting
Changes at your farm to manage for SWD

• Is it worth it or do you change to different crop?
• Do you shift your production to earlier? Is there a market, does it fit with in with the rest of your crops?
• Only grow what you can harvest on a daily basis
• Consider cutting back on production if you cannot manage
• Prepare for Labor increases.
  – Setting up netting and structure,
  – Or spraying every 5-7 days,
  – Extra harvest
  – Pruning and thinning
  – Increased labor to harvest infected fruit, remove from field, place in zip-lock bags to solarize for 1 week
• How are you going to control? Spray VS Net?
Spray vs. Net?

- If you are going to spray, you need a good sprayer. Pump backpack will not be effective for foliage penetration or coverage. Need air blast mist sprayer.

- Think about investments needed for your management decision. Motorized mist sprayer $699, Entrust, $459 per quart, Pyganic $195 per quart. Labor...

- ProTek 80 Netting 6,6’x328’ $291, structure $?, Labor... Life span of 7-10 years

- Think about what works for your farm? What else is going on at this time of year? What system can you manage best?
End walls
Clips to get in and out
Side walls
What we have observed over the last 3 years

- Netting works
- Organic sprays work
- Cooling berries post harvest for 24 hours, cuts down on emergence dramatically but challenging with a short shelf life product
- 2014 had minimal pressure in comparison to previous years. Was this a blip or the new norm?
Resources

- Mist sprayer/blower options

- Netting options
  - Berry Protection Solutions (413-329-5031) email (berryprotection@fairpoint.net)

- Vern
don’t freak out!
Ecological Thoughts on Spotted Wing Drosophila (SWD) (Drosophila suzukii)

Vic Izzo
University of Vermont
Insect Agroecology Lab and ARLG
Distribution and Abundance

Where?
When?
How Many?
How Often?
Some SWD Ecological Questions

Where? Where are they feeding?
Where do they overwinter?

When? When do they arrive?
When do they leave?

How? How fast do their pops grow?
How many make it through winter?
Where are they feeding?

Primary Hosts in VT*

1  2  3  4

*Based upon “Host Potential” aggregate statistic (Bellamy et al. 2013)

Implications

Strawberries may become a troubled crop
  - evolution and/or climate change…

Blueberries may be less problematic than previously thought

Pairing of raspberries with other open field berry crops may compound risk
When do they arrive (emerge)?
When do they leave?

Overwintering (and Reproductive Diapause*) Cues

Daylength  Temperature  Host Plant

*Reproductive diapause may occur prior to overwintering migration.
Implications

Early season fruit crops may be OK (for a while) given the current late season risk

Southern regions with warmer winters should be more cautious of mid-summer crops

Late season field crops may be less than ideal until better management strategies have been developed

Adult only monitoring may give wrong picture of threat
How many make it through winter??

Overwintering Survivorship

Mean (±SE) proportion of surviving D. suzukii per petri dish in response to 6-week temperature exposures.

Mean adult Drosophila suzukii survival at five constant temperatures in separate growth chambers.

Average heat lethal temperature is 90 F, and the average cold lethal temperature is 30F (Kimura, 2004).

Egg, larval, and pupal stages will not survive temperatures below freezing (CFIA, 2011; Lee et al., 2011b).
Where do they go?

Overwintering Sites
Implications

Post-season sanitation may be important for mitigating risk

Removing early season alternate hosts may also reduce risk

Cold winters suppress early season populations, for now…but in a warming climate…?
## How Fast do Populations Grow?

<table>
<thead>
<tr>
<th>Life Table Estimate</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Span</td>
<td>egg to adult mortality</td>
<td>86 ± 4 days</td>
</tr>
<tr>
<td>Growth Rate Individual</td>
<td>egg to adult</td>
<td>10-29 days</td>
</tr>
<tr>
<td>Mean Daily Fecundity</td>
<td># of eggs/oviposition</td>
<td>5.7 ± 0.24 eggs/day</td>
</tr>
<tr>
<td>Net (lifetime) Fertility Rate</td>
<td># of viable eggs/female lifetime</td>
<td>386.8 fertile eggs/female</td>
</tr>
<tr>
<td>Net (lifetime) Reproductive Rate</td>
<td># of viable DAUGHTER eggs/female lifetime</td>
<td>240.4 daughter eggs/female</td>
</tr>
<tr>
<td>Population Doubling Time</td>
<td>Time req. for population to double</td>
<td>3.87 days</td>
</tr>
</tbody>
</table>
Demographics

Life Stage (% of Population)

- Egg: 51%
- Adult: 25%
- Pupae: 16%
- Larva: 8% adults
Implications

Rapid growth rate of populations is bad news: even small #'s of winter survivors may be devastating

Traps poor indicators of population size: crops require fast action once a single adult is detected.
Invasions are dynamic processes
Invasions are dynamic processes
Exclusion netting for control of spotted wing drosophila (SWD) in commercial blueberries and raspberries

Rachel Schattman, PhD Candidate
Agroecology and Rural Livelihoods Group
UVM Dept. of Plant and Soil Science

Hannah Link, UVM undergraduate honors student
Project Overview

Overview: Netting trials conducted in blueberries and raspberries on two Vermont berry farms in 2014.

Treatments: ProtekNet 80, ProtekNet 60, a partial control (PN80) and control.

Sampling: Traps set and collected weekly to monitor adult SWD presence; berries collected to monitor for larval presence. Temperature recorded.
Raspberry results

Netting reduced total SWD pop in raspberry high tunnels.
More males than females found inside the netting. Why?
Temperature results

Significant differences between the inside and outside netting for both ProtekNet80 (p=0.009) and ProtekNet60 (p=0.0023).
Practical uses of netting on Vermont farms

- Observations 11 times at three farms
- Exploratory survey - 40 respondents from VT, NY, ME, NH, MA
- Three interviews with berry farmers from Vermont
Results: Trellis System Challenges and Advantages

Challenges
- Access to field
- Altered harvest experience
- Handling of fabric

Advantage
- Exclusion of other common wildlife pests--birds (turkey), deer
- Earlier ripening??

Wind-blown opening in a netting enclosure (2014)
Results: Ideal Trellis Systems

“How would you design the ideal insect netting trellis system for your farm?”

55% wanted a large structure they could walk into

59% wanted a system made from readily available materials
Results:
Suggestions for Trellising

1. Large net-box
2. Small net-box
3. Medium tunnel

all illustrations by artist Madeleine Lyman (2014)
Factsheet

● Accordian-style folding to store and spread
● Footballs and tennis balls to prevent ripping
● PDF will be on VVBGA website

Bird netting over half-acre vineyard at UVM’s Horticultural Research Center (2014)
Moving forward

Field scale trial

○ How much will the support-structure & netting cost?
  ■ Material
  ■ Labor
○ Additional challenges or advantages?
  ■ Validation / invalidation

⇒ cost / benefit analysis
Resources

Vermont Vegetable and Berry Growers Association 2014 updated fact sheet on SWD

Trap construction from easily accessible materials

Michigan State University SWD site
http://www.ipm.msu.edu/invasive_species/spotted_wing_drosophila

Cornell University Fruit SWD site
http://www.fruit.cornell.edu/spottedwing/

Penn State publication updates on SWD
http://extension.psu.edu/pests/ipm/agriculture/fruits/spotted-wing-drosophila/publication-updates-on-spotted-wing-drosophila
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All photos credited to Rachel Schattman or Hannah Link unless otherwise noted.
Questions?
Thoughts?
Song recommendations?