A weather station is mounted on a tripod in an orchard. The station includes a solar panel, a wind sensor, and a temperature/humidity sensor. The background shows rows of trees in an orchard under a clear blue sky.

Weather System Review for Iowa Orchards

Suzanne Slack
Iowa State University

What is a disease prediction model?

- Uses historical data and trends to determine the likelihood of a disease event
- Translates those parameters to current field conditions to predict disease
- We use weather stations to generate live data to make decisions

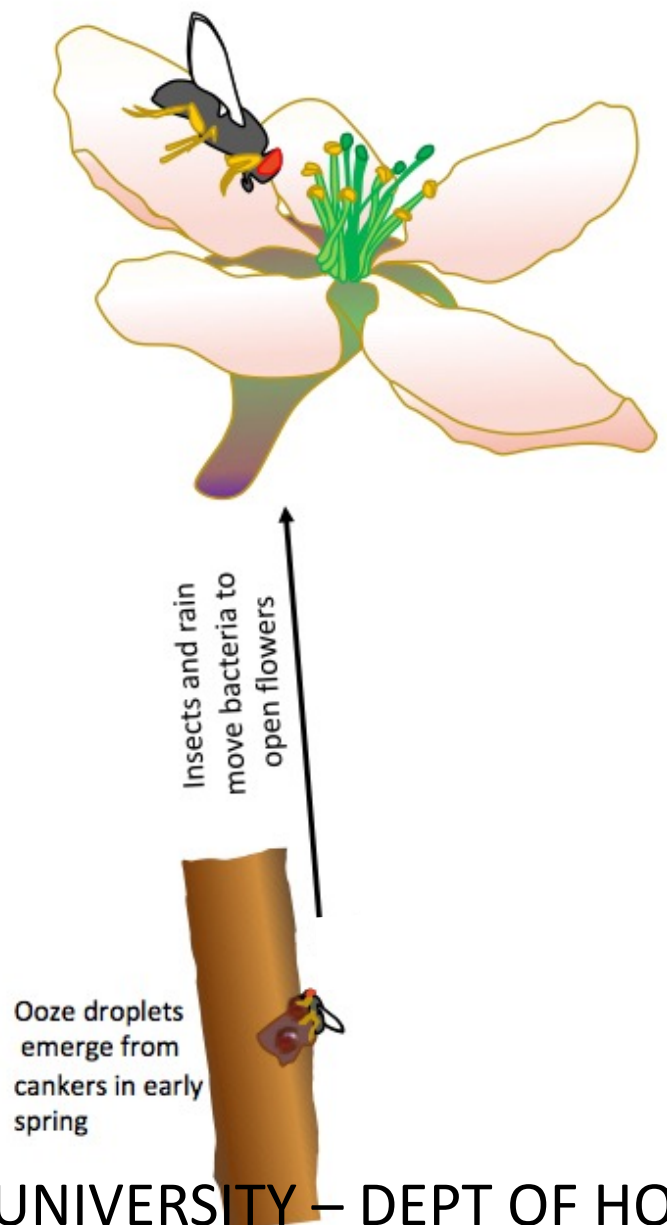
Fire blight of apple

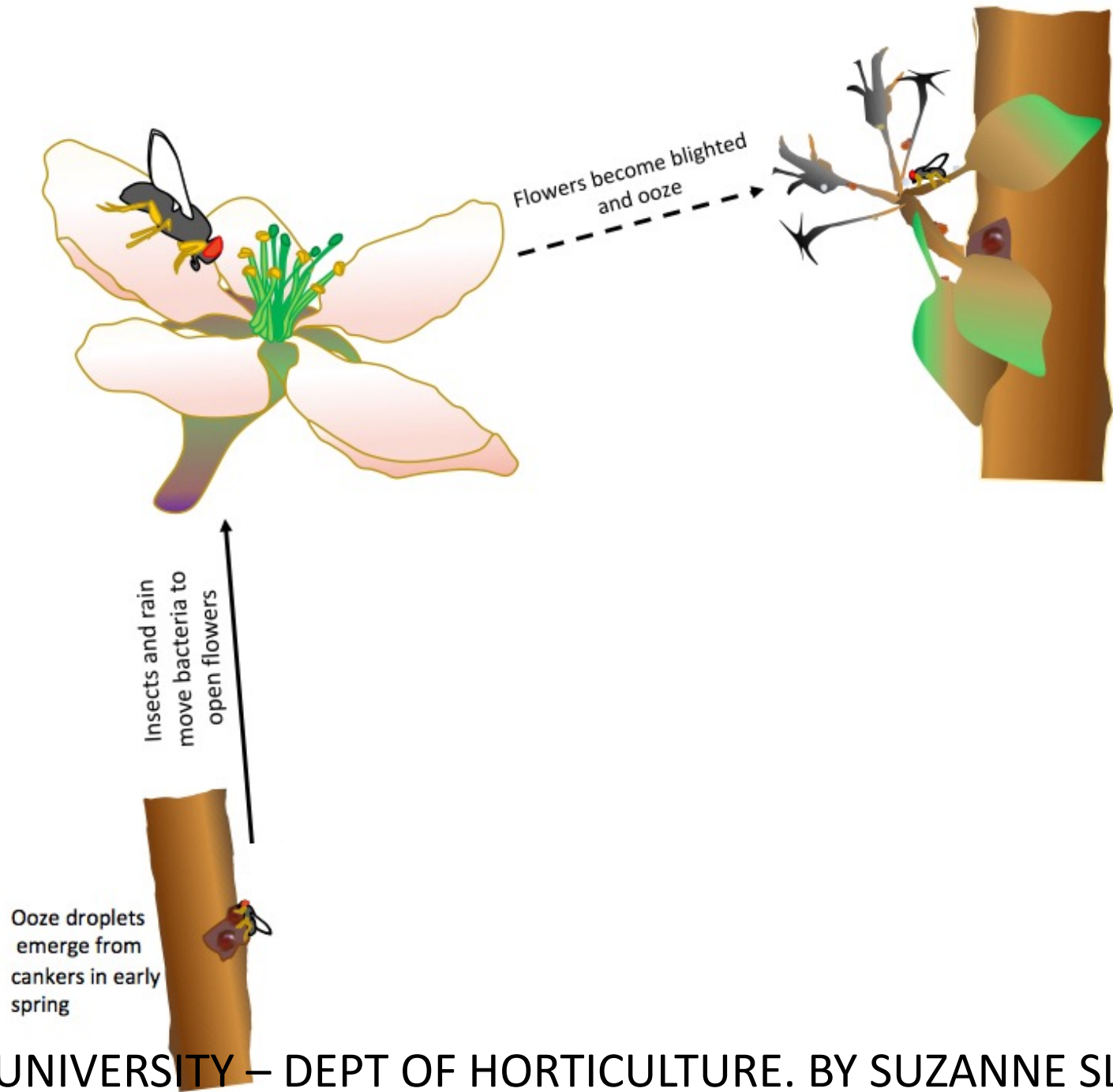
- First infection period is during flower bloom
- Disease prone to random epidemics

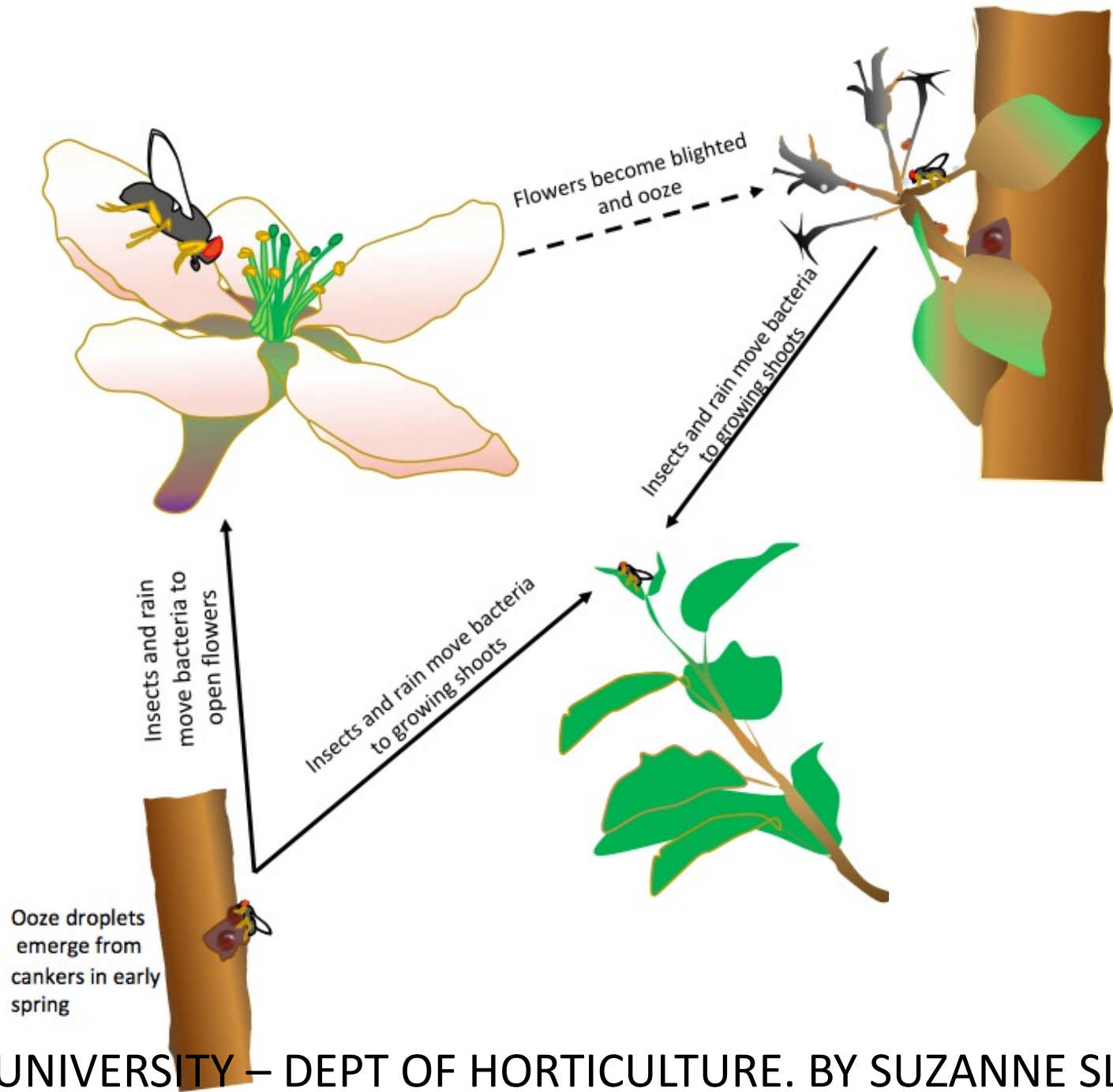


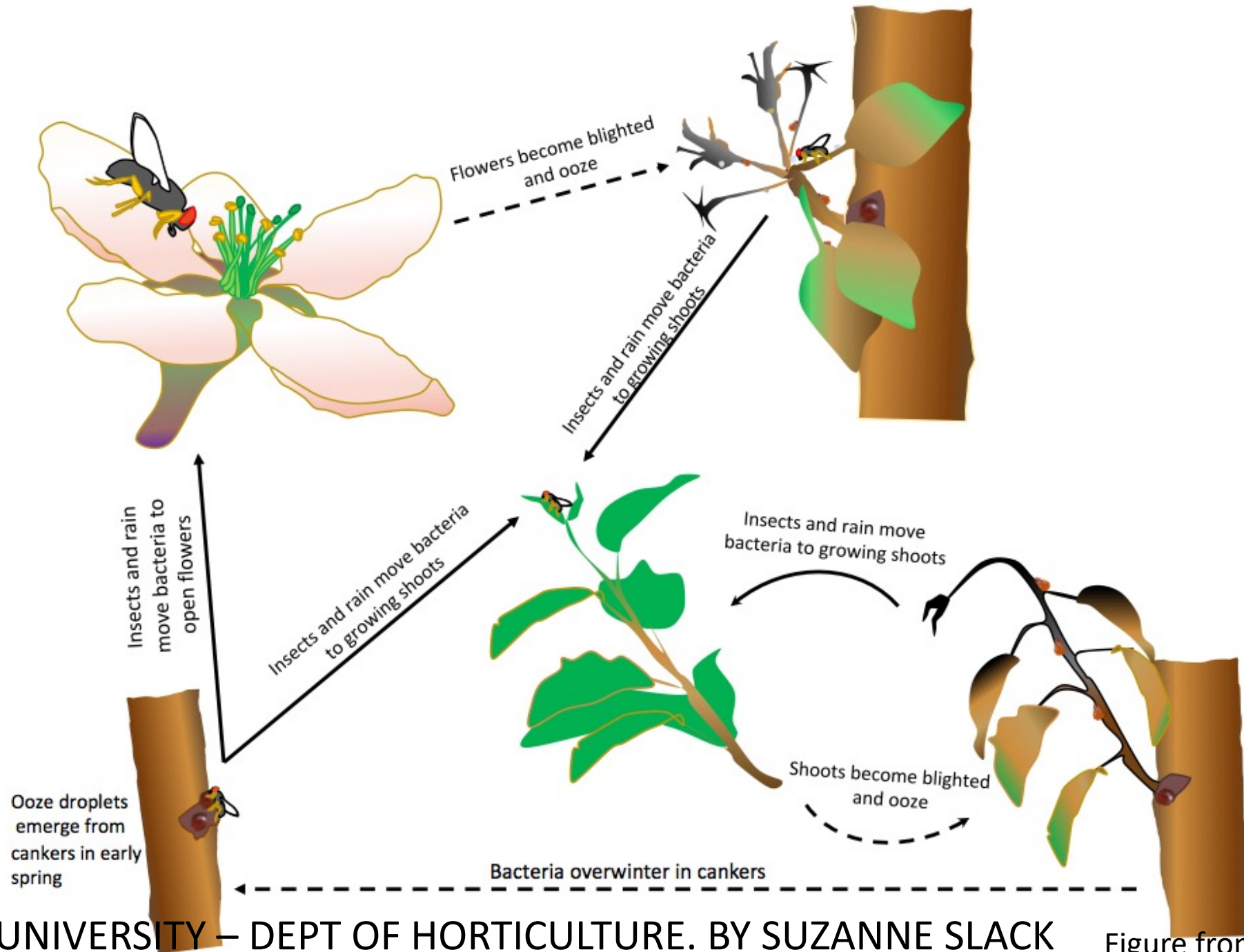
Ooze droplets
emerge from
cankers in early
spring

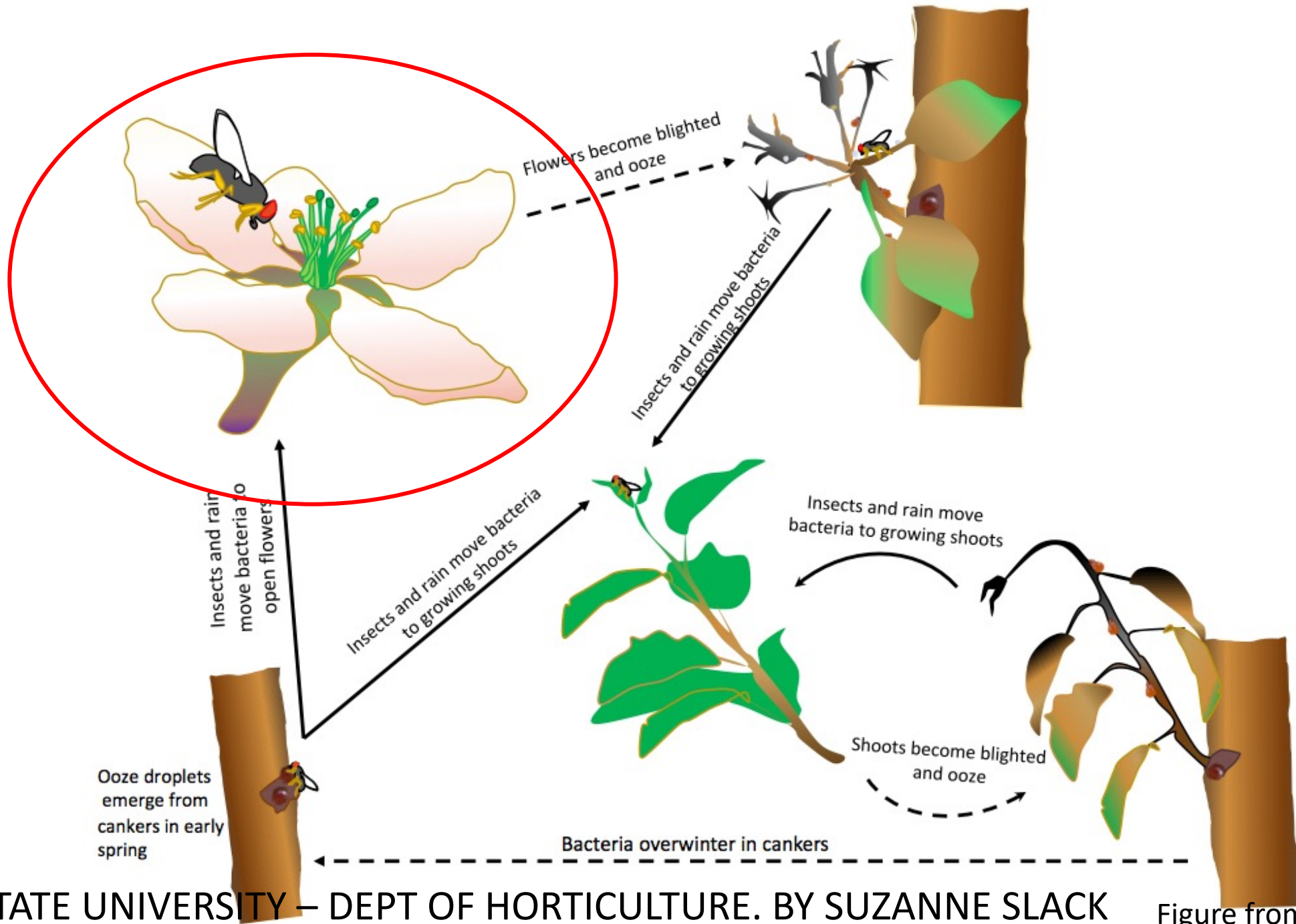




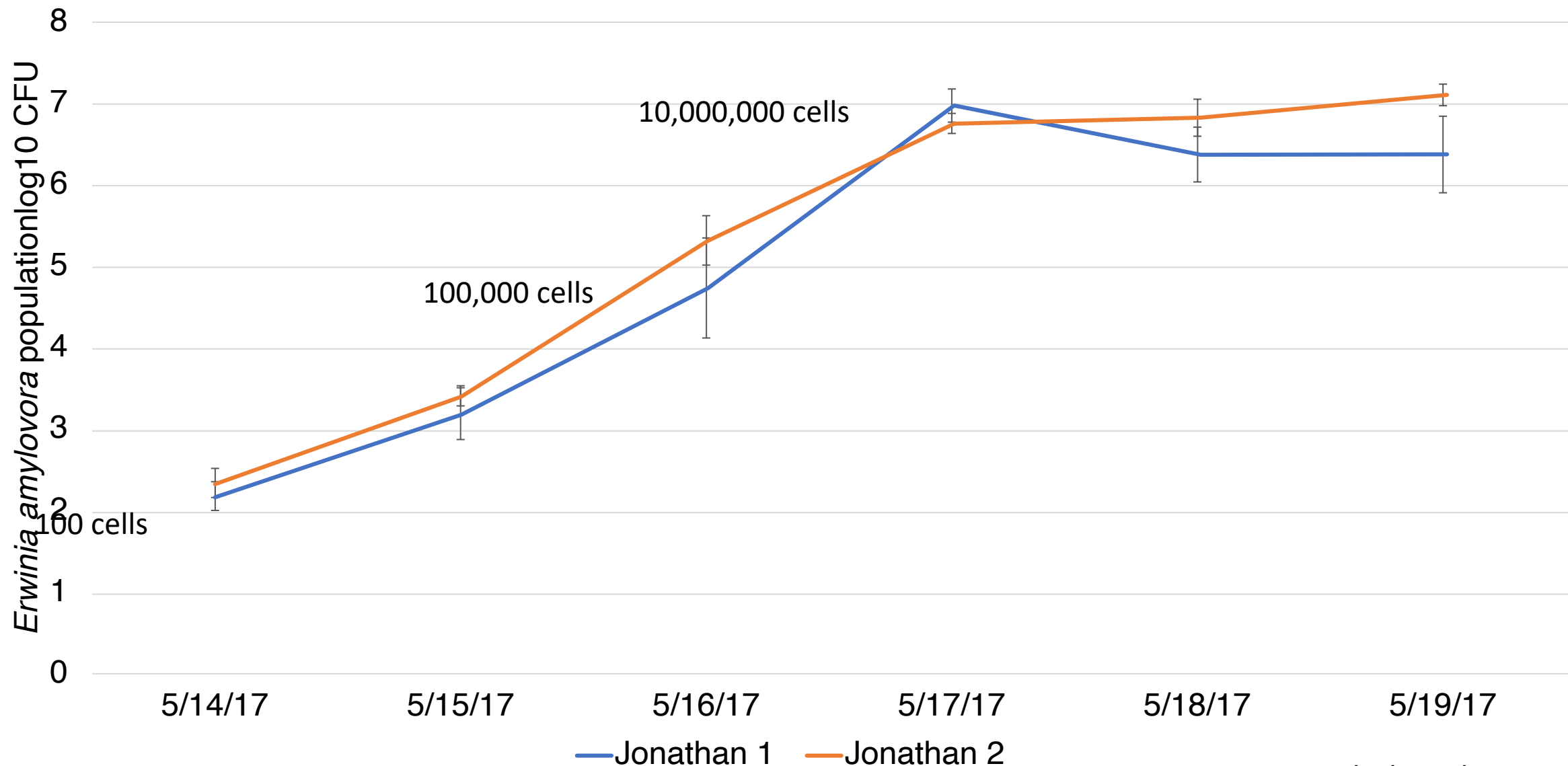




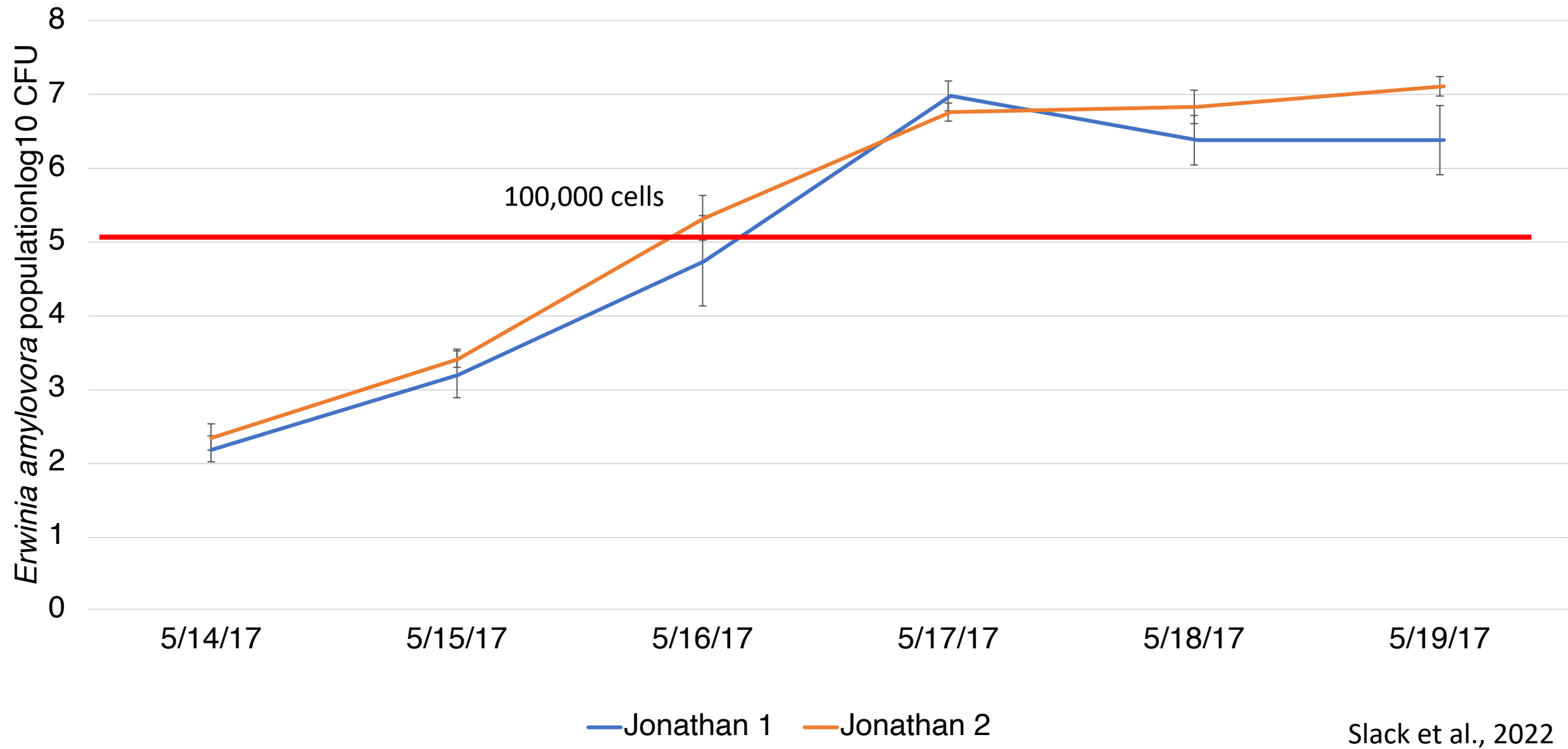








Slack et al., 2022



Maryblyt – fire blight model

- Developed by Dr. Paul Steiner and Mr. Gary Lightner, University of Maryland.
- Used only during bloom for blossom blight prevention



Maryblyt – fire blight model

Flower infection is predicted when all four of the following conditions are met:

1. Open flowers
2. A wetting event
(rain, dew, fog or spraying)
3. Average daily temperature of at least 60°F
4. Sufficient warm temperatures over the past several days
(increases bacterial pathogen growth on flowers)

Maryblyt calculates Epiphytic Infection Potential

- Epiphytic Infection Potential (EIP)
 - Tells the likelihood of an infection
 - Increases in value with potential severity
- If the EIP is above 40, then a wetting event can aid in bacteria mobility further into the flower

Spray recommendations based on EIPs

- 70 or above: Streptomycin or Kasumin
 - Kills the bacteria
- 40-70: Oxytetracycline or biological control
 - Halts bacteria growth, does not always kill them

Maryblyt output for 5/13:

2017		Temperature(F)			Rain		EIP for Biofix Date: (Bloom or spray date)						
Day	Date	Max	Min	Avg	in.	Chance of rain	5/13	5/14	5/15	5/16	5/17	5/18	5/19
Sunday	5/14	69.4	49	59.2	0	--							
Monday	5/15	73.5	38.6	56.1	0	--							
Tuesday	5/16	85.3	51	68.1	0.05	--							
Wednesday	5/17	84.2	67.4	75.8	0	--							
Thursday	5/18	84	54.4	69.2	0	--							
Friday	5/19	55	41.3	48.1	0	--							

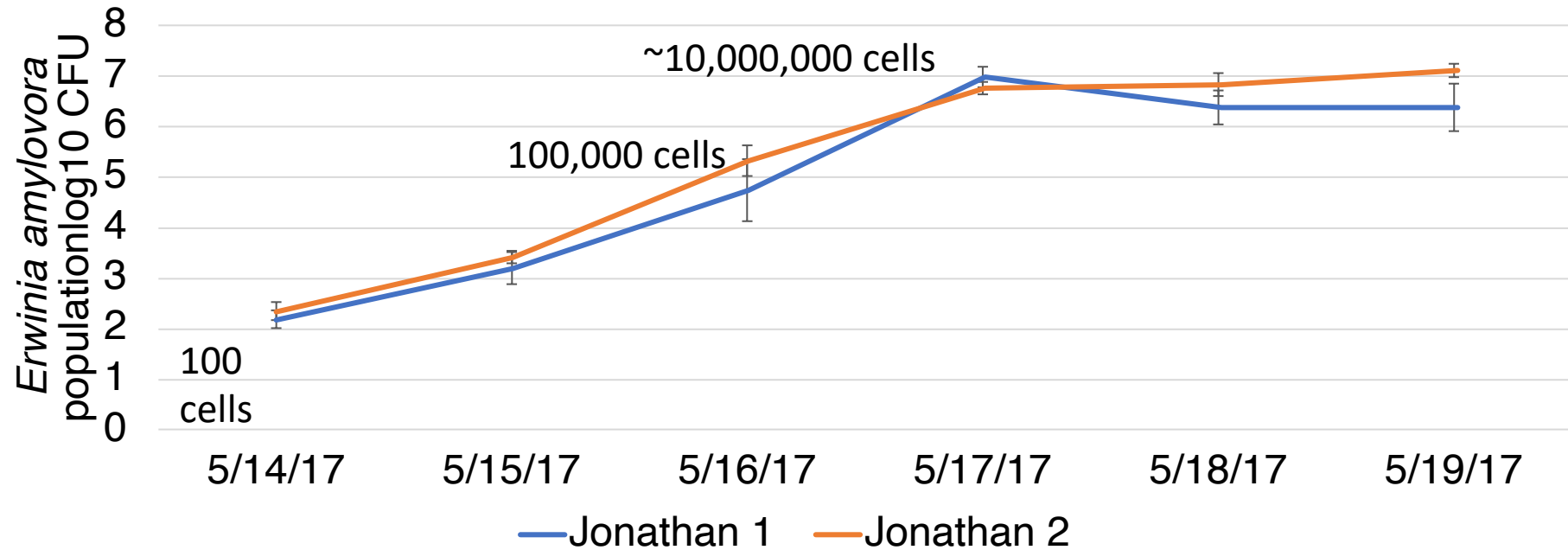
Maryblyt output:

2017		Temperature(F)			Rain		EIP for Biofix Date: (Bloom or spray date)						
Day	Date	Max	Min	Avg	in.	Chance of rain	5/13	5/14	5/15	5/16	5/17	5/18	5/19
Sunday	5/14	69.4	49	59.2	0	--	23	6					
Monday	5/15	73.5	38.6	56.1	0	--	45	27	21				
Tuesday	5/16	85.3	51	68.1	0.05	--	144	127	121	100			
Wednesday	5/17	84.2	67.4	75.8	0	--	255	255	255	233	134		
Thursday	5/18	84	54.4	69.2	0	--	350	350	350	350	250	117	
Friday	5/19	55	41.3	48.1	0	--	350	350	350	350	250	78	0

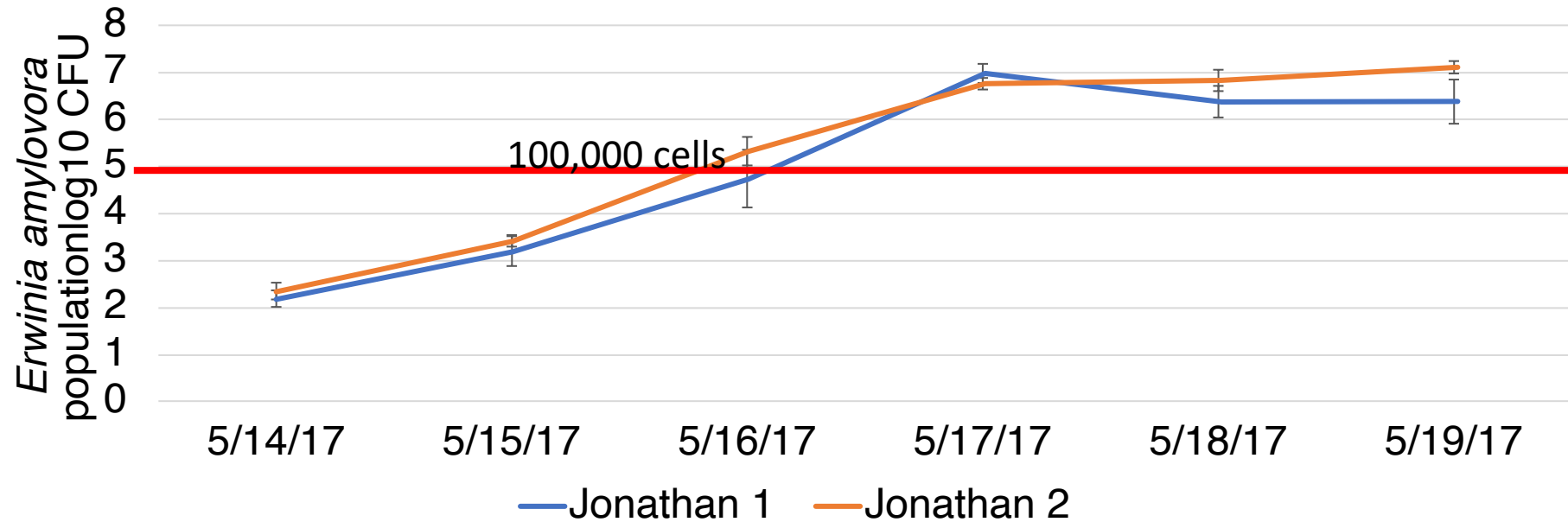
What if your flowers started to open on 5/13?

2017		Temperature(F)			Rain		EIP for Biofix Date: (Bloom or spray date)
Day	Date	Max	Min	Avg	in.	Chance of rain	5/13
Sunday	5/14	69.4	49	59.2	0	--	23
Monday	5/15	73.5	38.6	56.1	0	--	45
Tuesday	5/16	85.3	51	68.1	0.05	--	144
Wednesday	5/17	84.2	67.4	75.8	0	--	255
Thursday	5/18	84	54.4	69.2	0	--	350
Friday	5/19	55	41.3	48.1	0	--	350

2017		Temperature(F)			Rain		EIP for Biofix Date: (Bloom or spray date)						
Day	Date	Max	Min	Avg	in.	Chance of rain	5/13	5/14	5/15	5/16	5/17	5/18	5/19
Sunday	5/14	69.4	49	59.2	0	--	23						
Monday	5/15	73.5	38.6	56.1	0	--	45						
Tuesday	5/16	85.3	51	68.1	0.05	--	144						
Wednesday	5/17	84.2	67.4	75.8	0	--	255						
Thursday	5/18	84	54.4	69.2	0	--	350						
Friday	5/19	55	41.3	48.1	0	--	350						



2017		Temperature(F)			Rain		EIP for Biofix Date: (Bloom or spray date)						
Day	Date	Max	Min	Avg	in.	Chance of rain	5/13	5/14	5/15	5/16	5/17	5/18	5/19
Sunday	5/14	69.4	49	59.2	0	--	23						
Monday	5/15	73.5	38.6	56.1	0	--	45						
Tuesday	5/16	85.3	51	68.1	0.05	--	144						
Wednesday	5/17	84.2	67.4	75.8	0	--	255						
Thursday	5/18	84	54.4	69.2	0	--	350						
Friday	5/19	55	41.3	48.1	0	--	350						



Maryblyt considerations

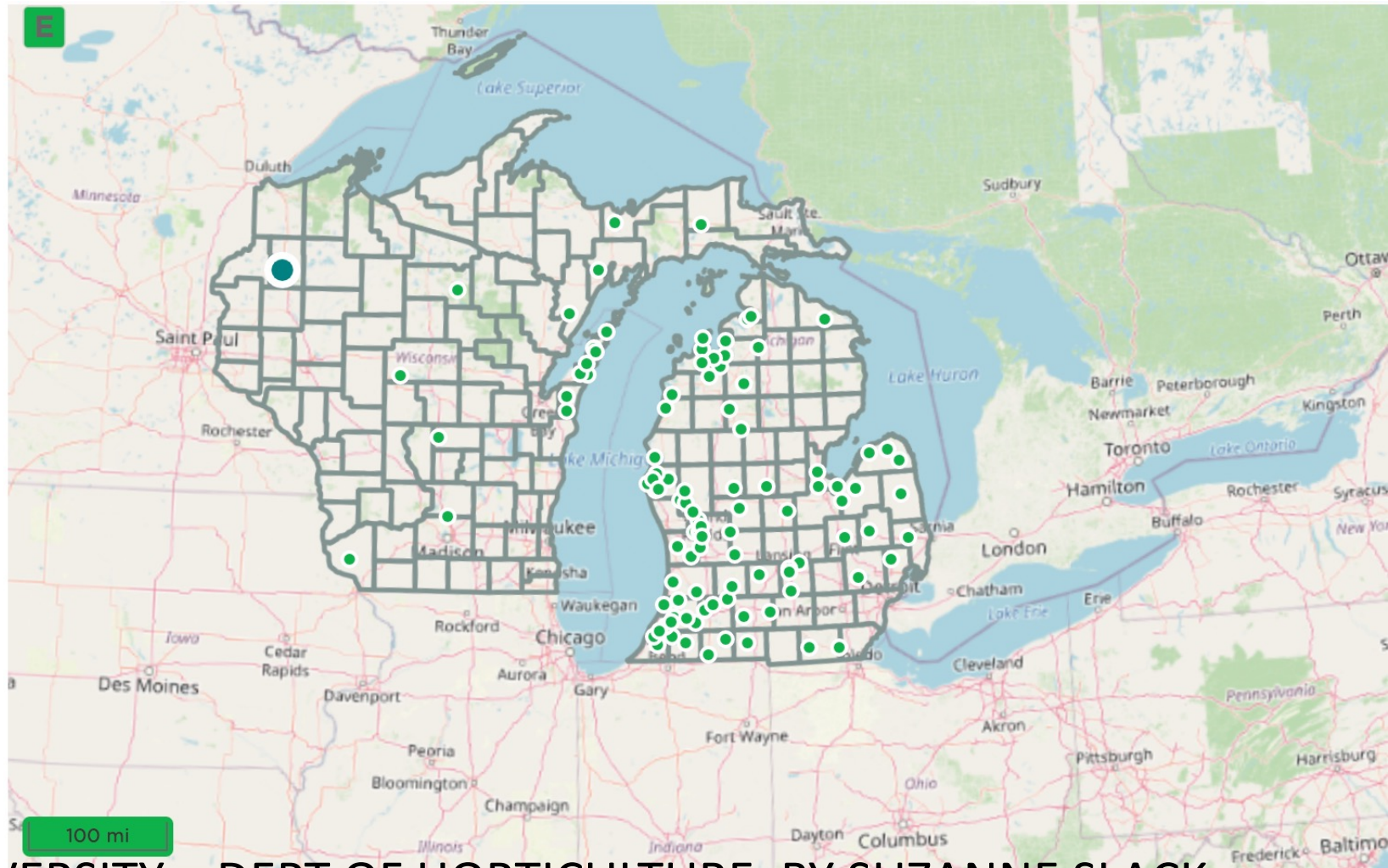
- Things to keep in mind:
 - Cultivar risk
 - When last spray application was made
 - Fire blight severity in the past
 - Doesn't consider all weather factors



Options for getting Maryblyt and other prediction

- Paid alert services – private, no network
- Enviroweather - public, network
- NEWA – public, network

Enviroweather from Michigan State



IOWA STATE UNIVERSITY – DEPT OF HORTICULTURE. BY SUZANNE SLACK

Fruit



Apple



Blueberry



Cherry



Grape



Peach



Pear



Other Small Fruit



Other Tree Fruit

Vegetables



Asparagus



Cole Crops



Cucurbits



Potato



Snap Beans



Sweet Corn



Other Vegetables

Landscape & Nursery



Christmas Trees



Deciduous Plants



Turfgrass



Other Landscape

Livestock



Nutrient Management



Odor Management

Field Crops



Alfalfa



Corn



Potato



Soybean



Wheat



Apple

Michigan is the third largest apple producing state in the U.S. Most of the production is located on the west side of the state near Lake Michigan. There are more apple trees in Michigan than there are people!

Management Tools

Development

- Pollen Tube Growth Model
- Apple Carbohydrate Thinning
- Apple Irrigation
- Apple Maturity Model

Pests

- Fire Blight
- Apple Scab
- Oriental Fruit Moth
- Codling Moth
- Sooty Blotch and Flyspeck
- Obliquebanded Leafroller
- Apple Maggot
- Current status of McIntosh and apple pests
- Seasonal history of McIntosh and apple pests
- Daily Summary of Weather and Disease Risk for Station
- Station Disease Report: Seasonal History of Wetting Events
- Regional Disease Report

Resources

- Apple Topographic Site Planning
- IPM Resources
- MSUE News for Fruit
- MSUE News for Apples
- Critical Temperatures for Frost Damage on Fruit Trees (USU Extension)
- Malusim Apple Tool

Dashboard ▾

Settings ▾

My Stations

Active Station:

East Lansing (MSUHort) ▾

Weather conditions at East Lansing (MSUHort) +

Weather conditions at Williamsburg 20m Tower +

Weather conditions at Sparta 20m Tower +

Weather conditions at Belding +

Watched Pest & Crop Models

Select a crop to view its models:

View All Watched Models ▾

Apple

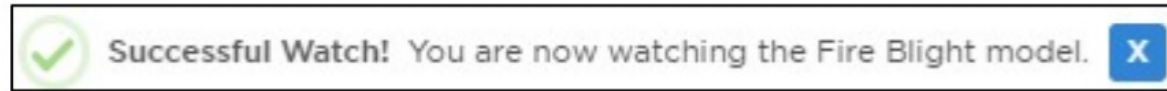
Codling Moth +

Fire Blight +

Apple Scab +

Apple Maturing Model +



In the example below we selected Apple from the drop down menu and then chose the Fire Blight Model. Clicking on the Watch button will add this model to your dashboard. You should see a message like this to confirm you are watching the Fire blight Model.



Pest & Crop Models


Pest and crop management models are organized by groups of crop, commodity or resource.

Instructions

1. Select a model by clicking the  icon to the right of the Crop or Product of interest.
2. Select a management model for that Crop or Product by clicking the  icon to the right of the management model.
3. Click on the Watch Button to add this to your dashboard.
4. Selecting Watch will also add this model to "My Watched Pest and Crop Models" in Settings.

My Watched Pest and Crop Models


Select a crop to view its models:








View All Watched Models 


You do not have not any watched Pest and Crop models. Please look below to start watching some.

Pest and Crop Models

Select a crop to view its models:

Apple 

Apple Maturity Model	
Codling Moth	
Obliquebanded Leafroller	
Oriental Fruit Moth	
Apple Scab	
Sooty Blotch and Flyspeck	
Fire Blight	

Watch 

The picture below shows what you would see after you hit the Save button. Note that you can edit (or delete) an entry by clicking on the symbols on the right.

My Watched Pest and Crop Models



Select a crop to view its models:
View All Watched Models

Apple

Fire Blight

Description **User Parameters** Bloom Dates Stop Watching

Date: Custom Site/Station: Dew/Fog/Spray: Bactericide: Trauma:

Date	Custom Site/Station	Dew/Fog/Spray	Bactericide	Trauma	Edit / Delete
05/18/2020	Sparty	Heavy Fog	Yes	No	 

[Click here to visit the full model](#)

For Fire Blight, the bloom period signals when an orchard is susceptible to blossom blight. The start and end dates of bloom are entered in the Bloom Dates tab. To do this, select the Bloom Dates tab and choose a Custom Site or Station, and then select the Date Range when bloom occurred. Clicking the Save button will store these bloom dates.

Your window should look something like the image below. Any time you run this model for the Custom site "Sparty" the bloom dates and other values you have entered here will be used to run the model.

The screenshot shows a web interface titled "My Watched Pest and Crop Models". At the top, there is a dropdown menu labeled "Select a crop to view its models:" with the option "View All Watched Models". Below this, the "Apple" section is active, and the "Fire Blight" model is selected. The "Bloom Dates" tab is highlighted with a yellow box. The interface includes a "Description" tab, "User Parameters" tab, and a "Stop Watching" button. The "Bloom Dates" configuration area contains a "Custom Site/Station:" dropdown menu with "Please select one..." and a "Date Range:" field with "Start Date" and "End Date" inputs. A green "Save" button is located below these fields. A table below the configuration area has a green header with columns: "Custom Site/Station", "Date Range", and "Edit / Delete". The table contains one row for "Sparty" with a date range of "05/15/2020 → 06/01/2020" and edit/delete icons. At the bottom, there is a link: "Click here to visit the full model".

Watched Pest & Crop Models

Active Station:

East Lansing (MSUHort) ▼

Select a crop to view its models:

View All Watched Models ▼

Apple

Fire Blight

This model was run on Tuesday, December 1st 2020, 9:00 pm, for the East Lansing (MSUHort) weather station.

Date	EIP	Risk
Mon, 05/25/2020	245	Infection (bloom)
Sun, 05/24/2020	145	High
Sat, 05/23/2020	61	Medium
Fri, 05/22/2020	26	High
Thu, 05/21/2020	21	Medium

Scroll left or right to see more information on large tables.

[Click here to visit the full model page.](#)

Network for Environment and Weather Applications

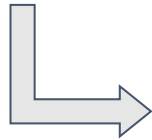
NEWA

nu-wa

nee-wa



Cornell Cooperative Extension



Network for Environment and Weather Applications



Northeast Regional Climate Center



Department of Earth and Atmospheric Sciences

New York State Department of Agriculture and Markets



National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE

Regional Institutions and grower associations

NEWA regional partnerships

Cornell Cooperative Extension
Cornell University, CALS
Enviroweather @ Michigan State University
Lake Erie Regional Grape Program
Illinois Grape Growers and Vintners Alliance
Illinois State University
Minnesota Apple Growers Association
New York State Integrated Pest Management Program
North Carolina Apple Growers
North Carolina State University
The Ohio State University
Penn State University
Purdue University*
Rutgers, The State University of New Jersey

University of Connecticut
University of Delaware*
University of Georgia*
University of Maine*
University of Massachusetts
University of New Hampshire
University of Vermont
University of Wisconsin-Madison
Utah State University
Virginia Tech
West Virginia University Extension Service
Wisconsin Grape Growers Association
Wisconsin Apple Growers Association

** New in 2022*

A website that behaves like an 'App'

Dashboard ★ My Favorite Stations: Dresden (FLX TDV2), NY

Results for Dresden (FLX TDV2), NY
Latitude: 42.71
Longitude: -76.97
Elevation: 643 ft
Courtesy of [New York State IPM Program](#)
Last download: 2/6/2022, 10:00 AM

Dresden (FLX TDV2) Overview Edit Weather Overview

At 10:00 AM today
☀️ **18 °F**
Base 50°F Degree Days since January 1: 0
Base 55°F Degree Days since January 1: 0
Relative Humidity: 65 %
Wind Speed: 14 mph

Yesterday
Precipitation: 0 in | High Temp: 19 °F | Low Temp: 6 °F

Today as of 10:00 AM
Precipitation: 0 in | High Temp: 18 °F | Low Temp: 5 °F

5-Day Weather Forecast

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
2/6/2022	2/7/2022	2/8/2022	2/9/2022	2/10/2022	2/11/2022
☀️	☁️	☁️	☁️	☁️	☁️
30 5	38 21	31 18	35 14	36 24	30 19

NEWA Weather Tools

- [Degree Day Calculator](#)
- [Hourly Data](#)
- [Daily Summary](#)
- [Regional Radar](#)

Newa Blog Get Help Profile Logout

Dashboard **Weather Tools** **Crop & IPM Tools**

Dashboard

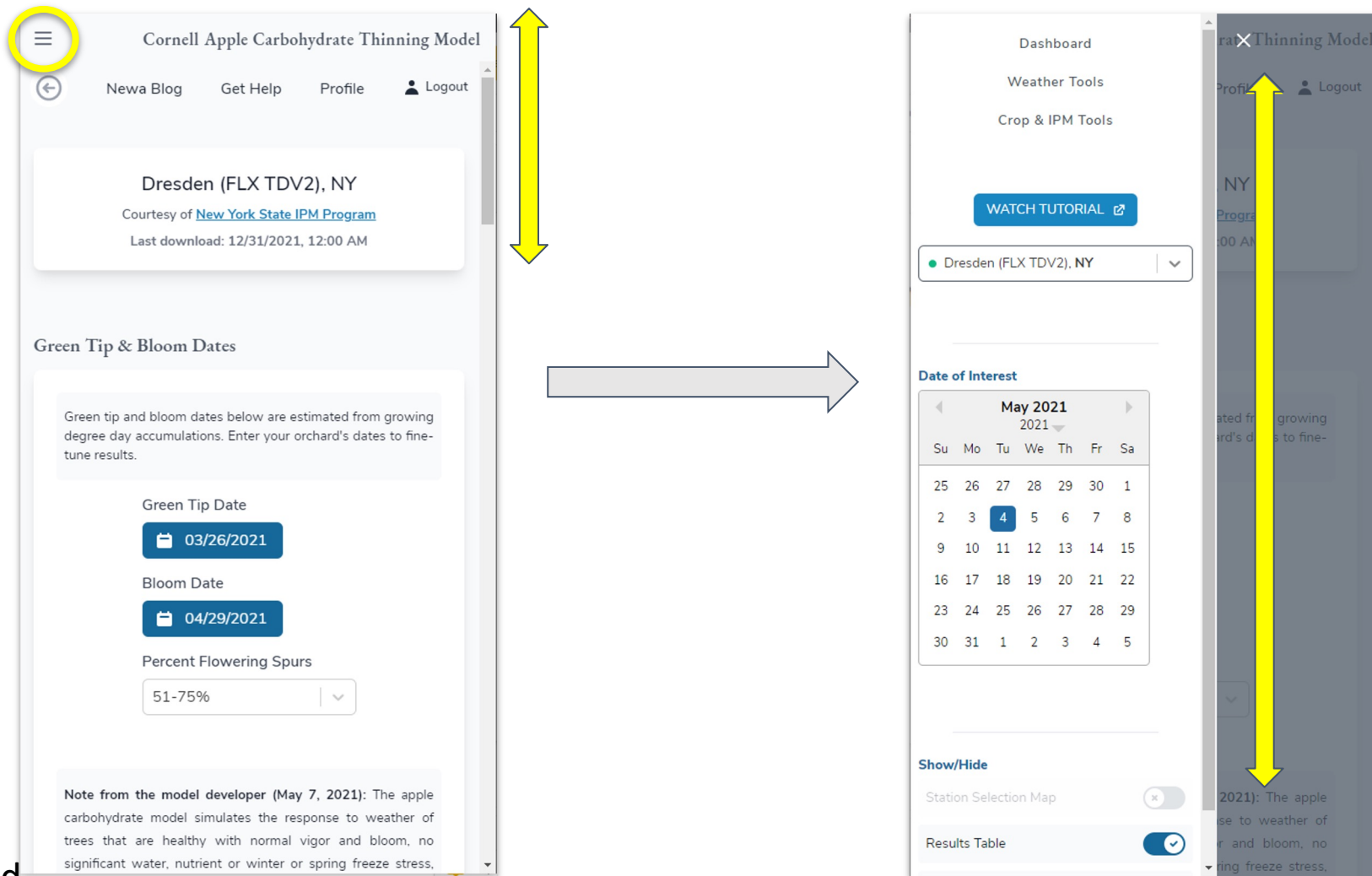
★ My Favorite Stations:
Dresden (FLX TDV2), NY

Dresden (FLX TDV2), NY
Courtesy of [New York State IPM Program](#)
Last download: 2/6/2022, 10:00 AM

Dresden (FLX TDV2) Overview Edit

At 10:00 AM today
☀️ **18 °F**
Base 50°F Degree Days since January 1: 0
Base 55°F Degree Days since January 1: 0
Relative Humidity: 65 %
Wind Speed: 14 mph

Smartphone and tablet navigation



Getting to know NEWA 3.0

Best Practice #1

Use The Network for Environment and Weather Applications to supplement knowledge and expertise shared by Extension professionals and researchers.

Best Practice #2

Use The Network for Environment and Weather Applications as one part of a broader well-informed integrated pest management strategy.

Best Practice #3

Ask for help early if you are struggling with the NEWA 3.0 platform.

Get started

New York State IPM Program
NEWA knowledge base
Network for Environment and Weather Applications

Submit a request

Network for Environment and Weather Applications > Apples

Apples

Learning resources for NEWA apple tools.

Get started

- Create and Configure Your User Profile for Apple Production (3 minutes)
- Dashboard Navigation for Apple Production (3 minutes)
- Additional Resources for Apple Production

Disease management

- Apple Scab Model (9 minutes)
- Fire Blight Model (10 minutes)
- Sooty Blotch and Fly Speck Model (7 minutes)

Record keeping

- Degree Day Calculator for Apple Production (2 minutes)
- All Weather Data Query Tool for Apple Production (4 minutes)

Crop load management

- Pollen Tube Growth Model (7 minutes)
- Apple Carbohydrate Thinning Model (6 minutes)
- Apple Irrigation Tool (4 minutes)

Insect pest management

- Apple Maggot Model (5 minutes)
- Codling Moth Model (5 minutes)
- Obliquebanded Leafroller (4 minutes)
- Oriental Fruit Moth (8 minutes)
- Plum Curculio Model (5 minutes)
- San Jose Scale (6 minutes)

[See all 7 articles](#)



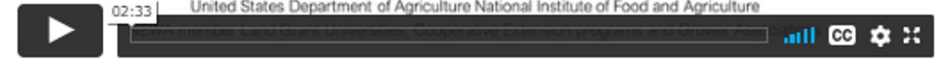
Create and Configure Your User Profile for Apple Production (3 minutes)

NEWA 3.0

Create and configure your user profile Quickstart Tutorial

produced by
The New York State Integrated Pest Management Program
and Cornell Cooperative Extension
in the Cornell University College of Agriculture and Life Sciences

with support from
New York State Department of Agriculture and Markets
United States Department of Agriculture National Institute of Food and Agriculture



* Closed captioning (CC) is available.

Additional resources

[Dashboard navigation for apple production \(3 minutes\)](#)

Help desk support

support@newa.zendesk.com

Apple resources

New York State IPM Program
NEWA knowledge base
Network for Environment and Weather Applications

Submit a request

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Apples

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- San Jose Scale (6 minutes)
- See all 7 articles



Fire Blight Model (10 minutes)

NEWA 3.0 Fire Blight Model Quickstart Tutorial

produced by
The New York State Integrated Pest Management Program
and Cornell Cooperative Extension
at the Cornell University College of Agriculture and Life Sciences

with support from
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United States Department of Agriculture National Institute of Food and Agriculture



* Closed captioning (CC) is available.

Model page

<https://newa.cornell.edu/fire-blight>

Additional resources

[Create and configure a profile account \(3 minute video\)](#)

[Dashboard navigation \(3 minute video\)](#)

[Apple Biofix Record Sheet](#)

[Apple Fire Blight Susceptibility in Apple Cultivars and Rootstocks](#)

Frequently Asked Questions

[What apple variety is required for 'First Blossom Open Date'?](#)

Help desk support

support@newa.zendesk.com



Weather stations

Onset Data Loggers

<https://www.onsetcomp.com/corporate/partners/newa>

Matt Sharp, Strategic Sales Representative

Environmental & Agricultural Monitoring

508.473.3126

matt_sharp@onsetcomp.com



KestrelMet (formerly RainWise)

<https://kestrelmet.com/kestrelmet-6000-ag-weather-station>

Eric Rollins, Senior Global Sales Manager

RainWise Professional Weather Instruments

207.266.8465

erollins@rainwise.com



What system is best for Iowa?

- Farms spread out; stations best used within 5-10km
- NEWA and Enviroweather both allow customization of services for Iowa weather
- Enviroweather stations are cheaper
- NEWA has more support for out of state
- Enviroweather was made for fruit and just starting to expand out of Michigan/Wisconsin fruit regions