CEWIPM.org
Corn Earworm Integrated Pest Management

Addressing evolving CEW management challenges in sweet corn grown in the Eastern US

9AM-5PM Monday January 26, 2026

In person location:
Magnolia C
Hershey Lodge
325 University Drive, Hershey, PA 17033

Meeting link:
https://umd.zoom.us/j/98907773433

Agenda:

9:00-9:20- Introductions
9:20-9:35- Project overview (Kelly Hamby)
9:35-9:40- Long Island trap comparisons (Jared Dyer)
9:40-9:55- CEW flight behavior informs lure placement and trap design (Christophe Duplais)
9:55-10:05- Full room discussion
10:05-10:20- Optimizing trap placement for improved CEW monitoring (John Mahas)

10:20-10:35- Break and photo voting
10:35-10:55- Trapping and threshold roundtable discussions
10:55-11:05- Roundtable discussion summaries
11:05-11:30- Reflecting on the 2025 season (Stakeholder advisory panel members)
11:30-11:40- Policy issues to be aware of (Tom Kuhar)
11:40-11:50- Full room discussion

11:50-1:00- Lunch
1:00-1:10- Vial bioassay resistance monitoring (David Owens)
1:10-1:30- Insecticide efficacy and diamide resistance monitoring (Kemper Sutton)
1:30-1:40- Anonymous live polling
1:40-2:00- Polling results discussion
2:00-2:15- Spraying marginal Bt hybrids (Anders Huseth)
2:15-2:30- Full room discussion

2:30-3:30- Coffee break and poster session (see next page)
3:30-3:45- Using evaluation and social science to boost adoption of BMPs (Colby Silvert)
3:45-3:55- Full room discussion
3:55-4:15- Project reflections and next steps (Kelly Hamby)
4:15-4:35- Next steps roundtable discussion
4:35-4:45- Roundtable discussion summaries
4:45-5:00- Conclusions and wrap-up

Project Overview

Kelly Hamby
Associate Professor and Extension Specialist
University of Maryland
kahamby@umd.edu

CEW IPM.org
Corn Earworm Integrated Pest Management

SCRI project team co-authors

Entomology and extension: Galen Dively, Jared Dyer, Michael Crossley, Daniel Gilrein, Kelly Hamby, Anders Huseth, Thomas Kuhar, Brian Nault, David Owens

Agricultural chemistry: Christophe Duplais

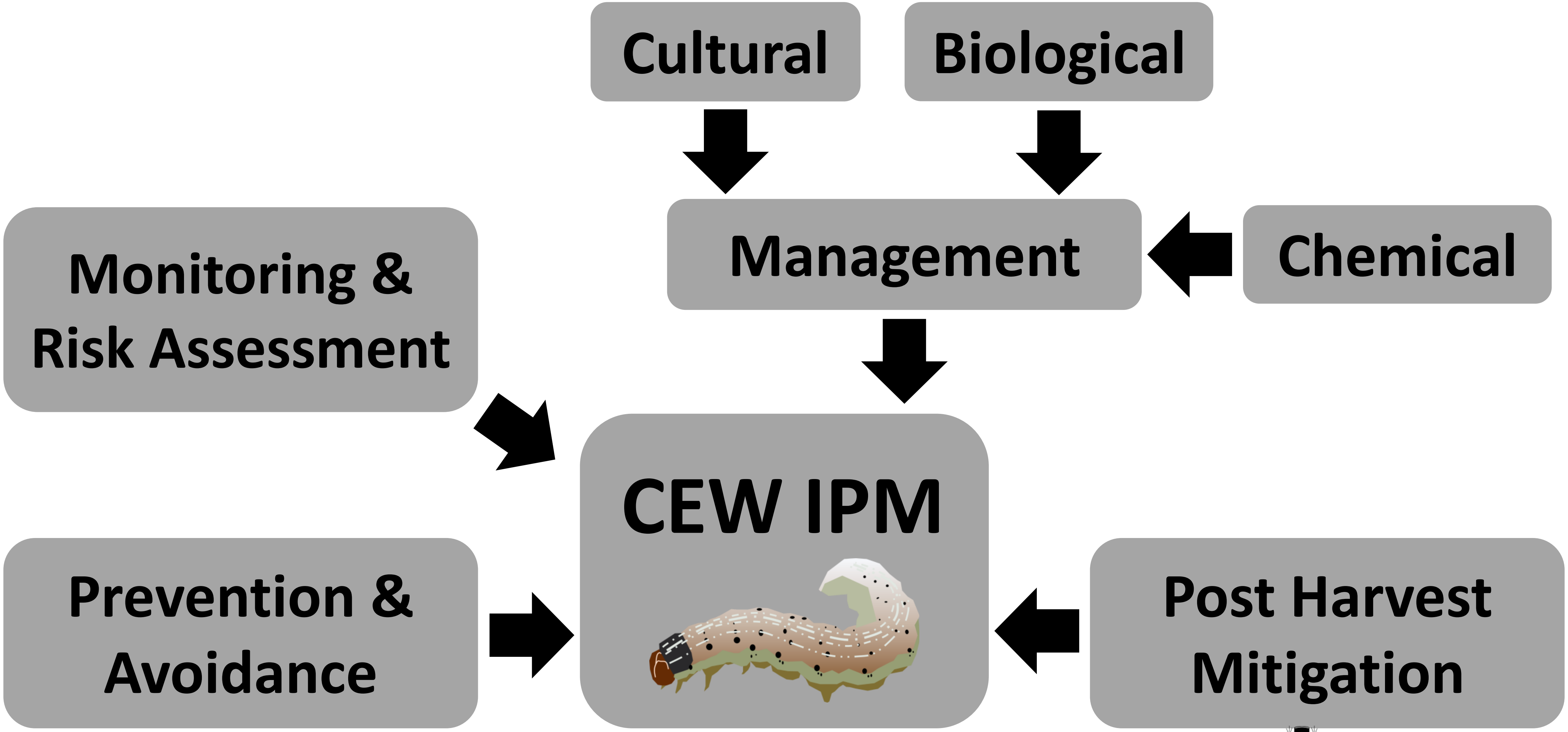
Geospatial analytics: Chris Jones, Ross Meentemeyer

Economics: James MacDonald

IPM Centers: Deborah Grantham, Joseph LaForest

Sociology: Colby Silvert

Improving corn earworm management



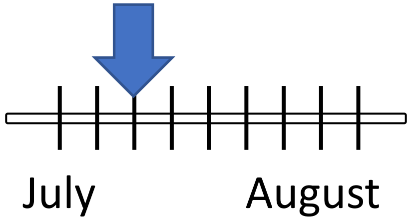
CEWIPM.org
Corn Earworm Integrated Pest Management

Improving corn earworm management

- **Understanding climate and resistance impacts on pressure**
- Improving trapping and monitoring
- Evaluating and improving thresholds
- Evaluating and improving IPM programs
- Evaluating costs and benefits
- Better understanding management decision making
- Developing useful resources

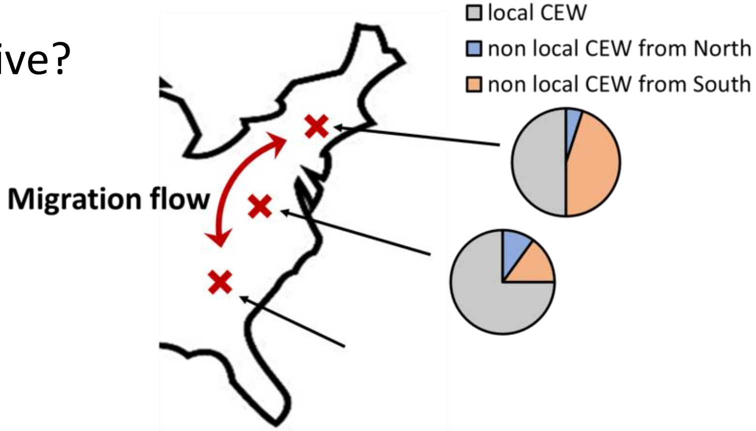
CEWIPM.org
Corn Earworm Integrated Pest Management

Understanding changing population dynamics



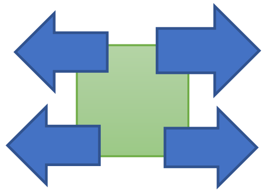
When are they becoming active?

Poster



Where are they coming from?

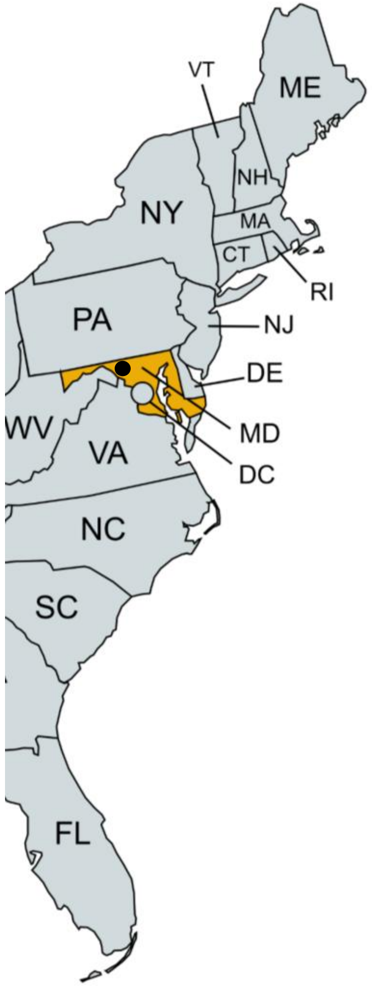
Can they survive the winter?

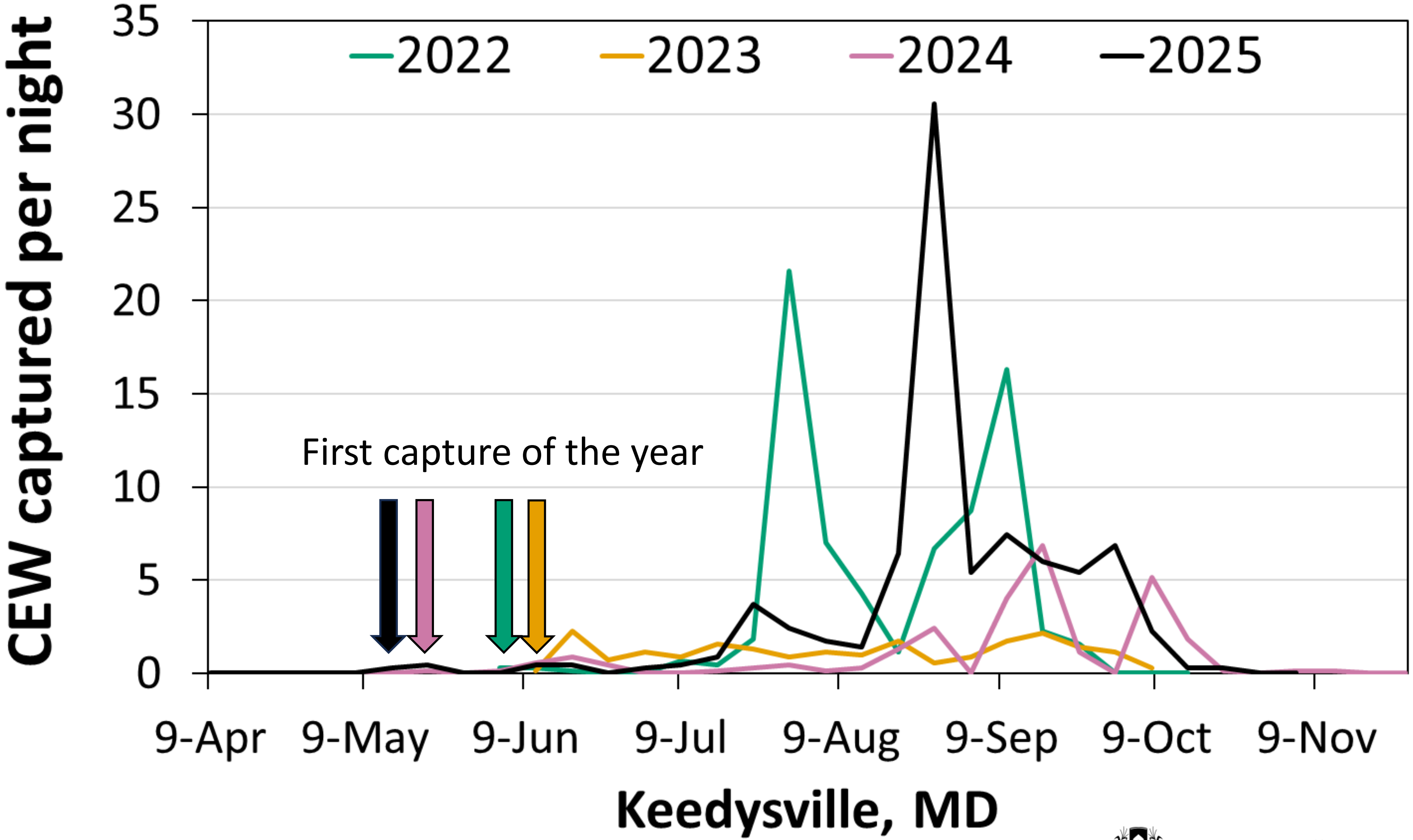


Can we forecast their arrival?

Poster

When are they active?

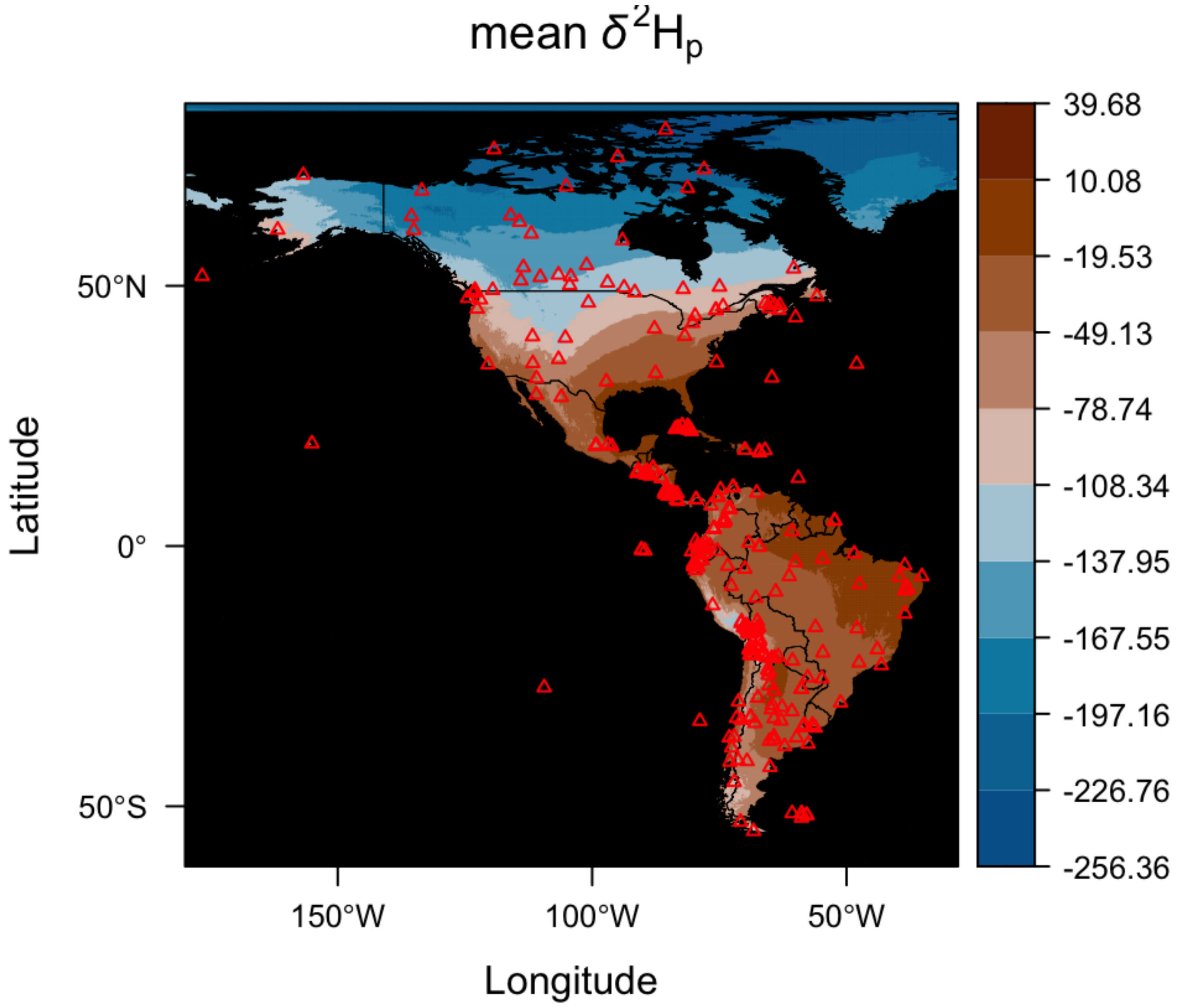




CEWIPM.org
Corn Earworm Integrated Pest Management

Where are they coming from?

Step 1. Build an "isoscape" that maps expected isotope values based on measurements in rainwater



CEWIPM.org
Corn Earworm Integrated Pest Management

Where are they coming from?

Step 1. Build an "isoscape" that maps expected isotope values based on measurements in rainwater

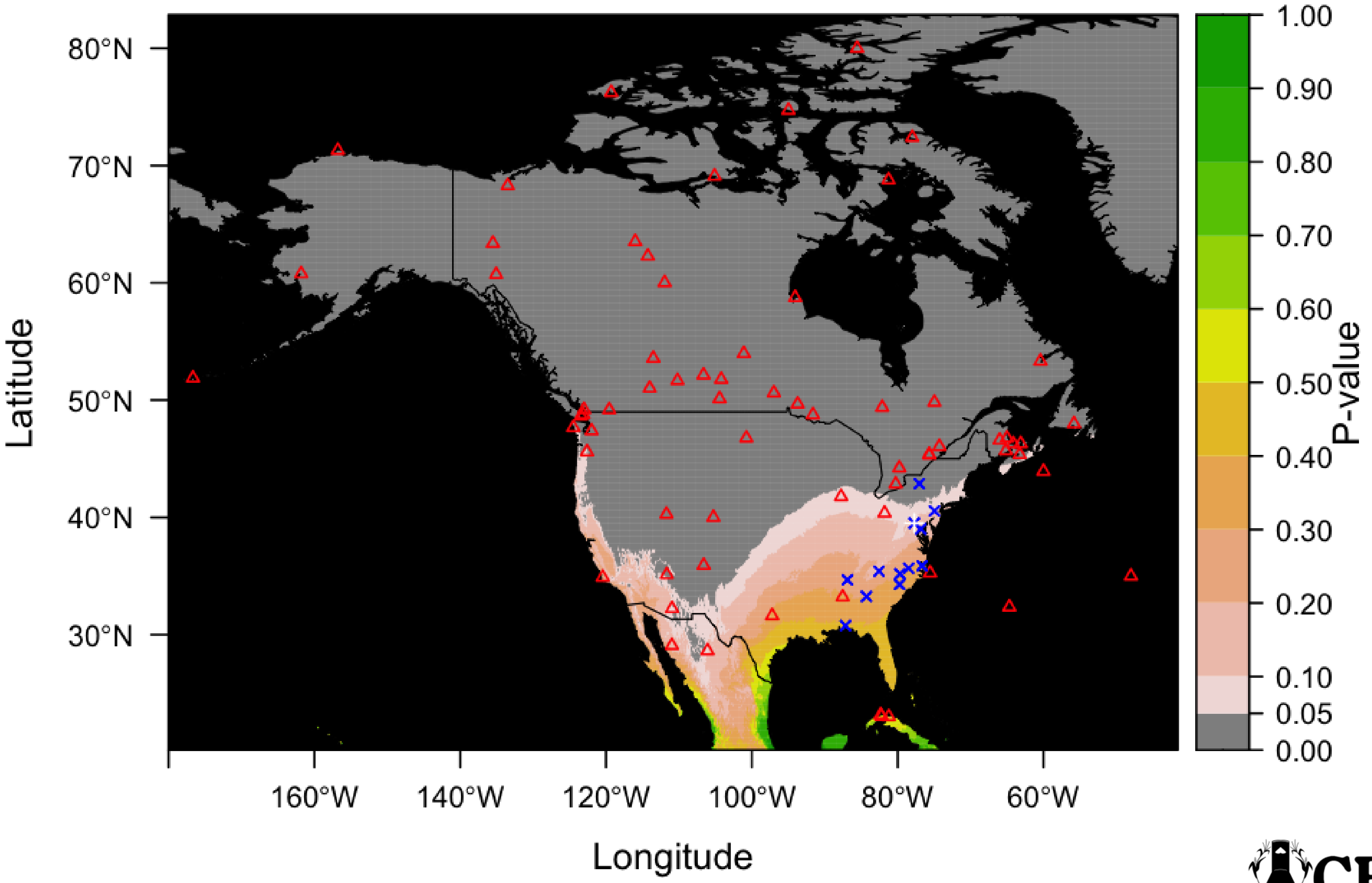
Step 2. "Calibrate" the isoscape based on isotope values in known-origin moths (how different are values in wings from values in rainwater?)

- collected 54 calibration samples

Step 3. Use statistical models to infer origins of moths collected throughout the season

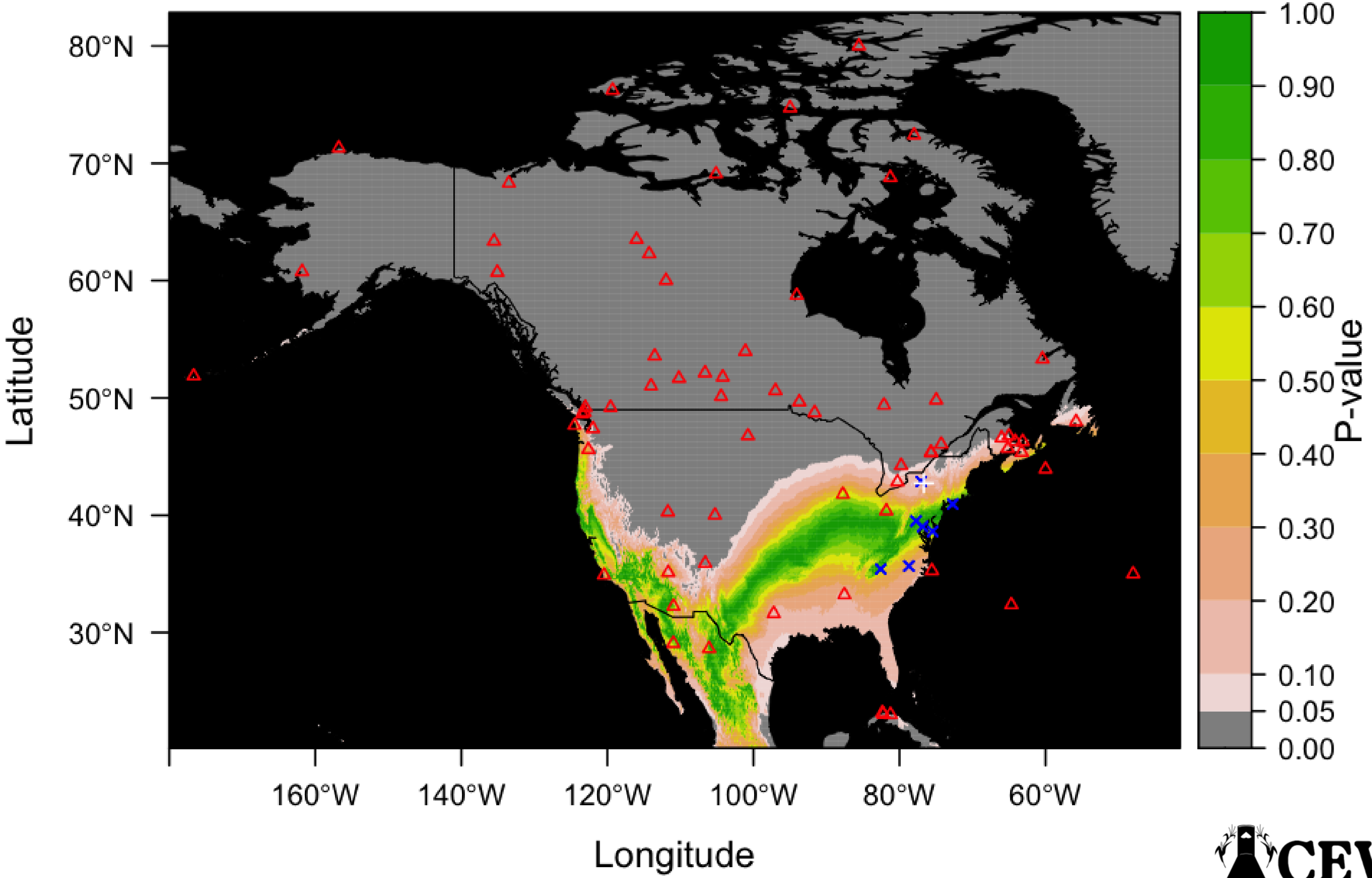
- Currently processing 78 samples from DE, MD, NJ, NY, and VT
- More to come

May 15 2024 Maryland sample



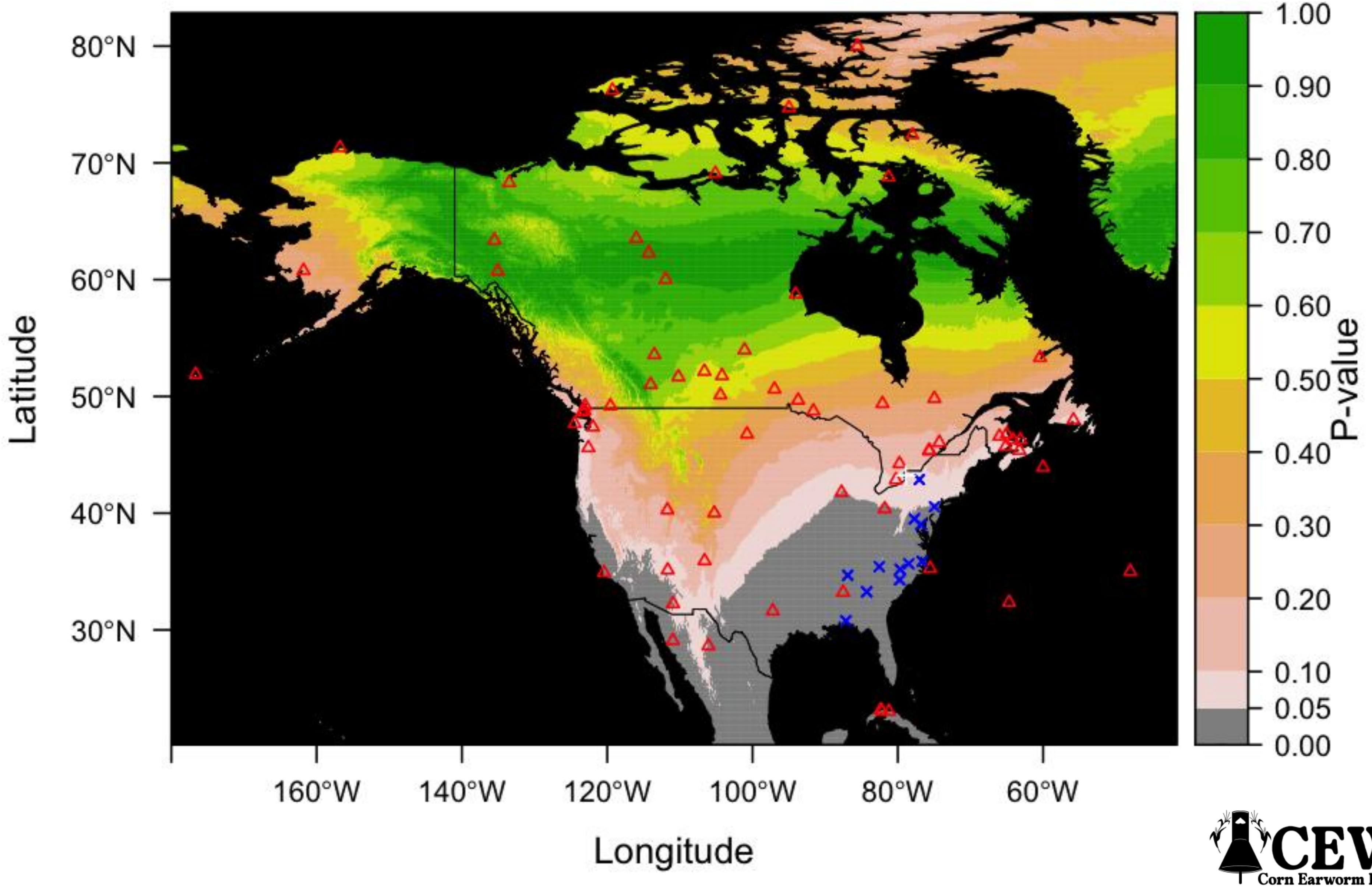
CEWIPM.org
Corn Earworm Integrated Pest Management

June 13, 2023 NY sample



CEWIPM.org
Corn Earworm Integrated Pest Management

June 10, 2024 NY sample



CEWIPM.org
Corn Earworm Integrated Pest Management

Can they survive the winter?

Fall 2024 – Set up September 9

Winter 2025– Removed cage October 23, 2024

CEWIPM.org
Corn Earworm Integrated Pest Management

Can they survive the winter?

Spring 2025 – Installed cages March 11, 2025

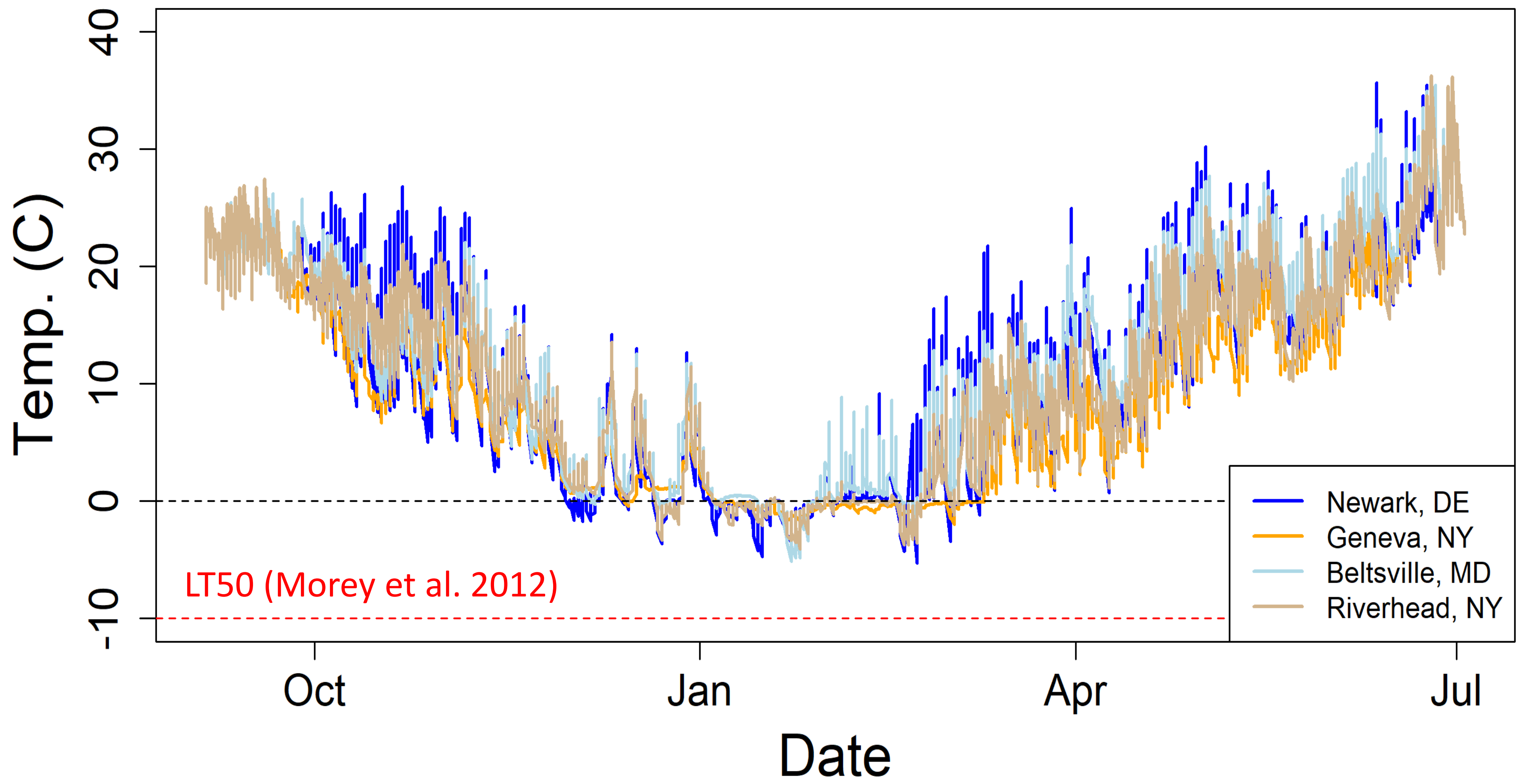
CEWIPM.org
Corn Earworm Integrated Pest Management

Can they survive the winter?

Summer 2025 – Dug beneath cages July 1-2, 2025

CEWIPM.org
Corn Earworm Integrated Pest Management

No moths emerged at any site



Did not get or stay cold long enough for 100% mortality

CEWIPM.org
Corn Earworm Integrated Pest Management

DO they survive the winter? If not, why?

Could soil moisture be to blame?

- Now monitoring that too

Could late-emergence be to blame?

- Some larvae collected in Sep-Oct eclosed in the lab

CEWIPM.org
Corn Earworm Integrated Pest Management

Monitor resistance

How are foliar insecticides performing?

Presentations

How are Bt hybrids performing?

Poster

CEWIPM.org
Corn Earworm Integrated Pest Management

Improving corn earworm management

- Understanding climate and resistance impacts on pressure
- **Improving trapping and monitoring**
- Evaluating and improving thresholds
- Evaluating and improving IPM programs
- Evaluating costs and benefits
- Better understanding management decision making
- Developing useful resources

CEWIPM.org
Corn Earworm Integrated Pest Management

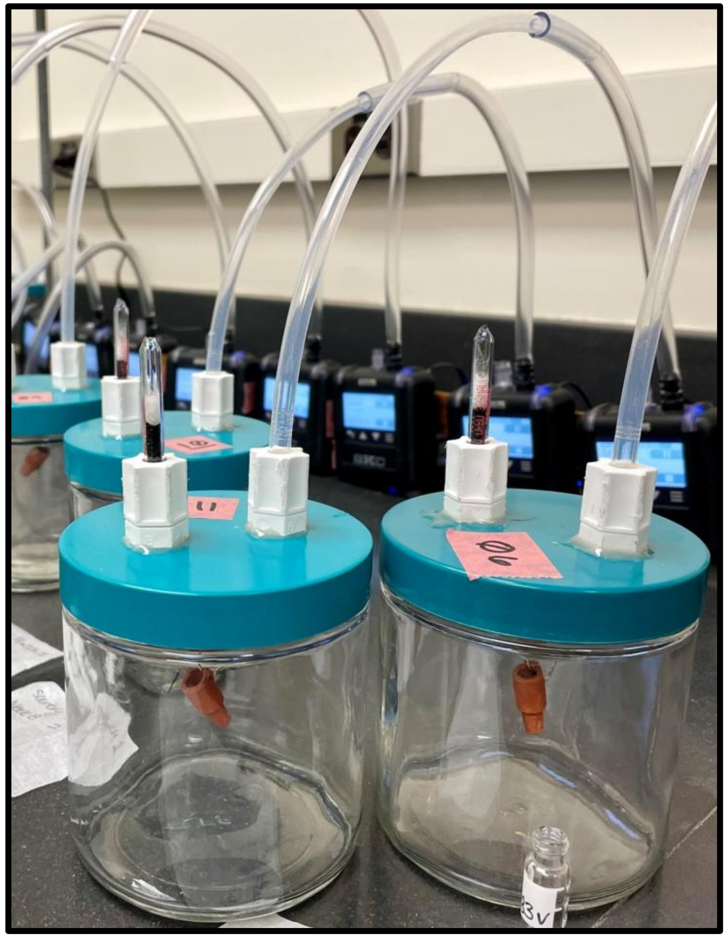
Multiple studies 2023-present

Trécé® Pherocon Corn Earworm

Alpha Scents Corn Earworm

Scentry® Corn Earworm

Hercon® Luretape®



Webinar recording

Presentations

Improving corn earworm management

- Understanding climate and resistance impacts on pressure
- Improving trapping and monitoring
- Evaluating and improving thresholds
- Evaluating and improving IPM programs
- Evaluating costs and benefits
- Better understanding management decision making
- Developing useful resources

CEWIPM.org
Corn Earworm Integrated Pest Management

Improving corn earworm management

- Understanding climate and resistance impacts on pressure
- Improving trapping and monitoring
- **Evaluating and improving thresholds**
- Evaluating and improving IPM programs
- Evaluating costs and benefits
- Better understanding management decision making
- Developing useful resources

CEWIPM.org
Corn Earworm Integrated Pest Management

2024-2025 sprayed Bt and non Bt corn

Presentation

Improving corn earworm management

- Understanding climate and resistance impacts on pressure
- Improving trapping and monitoring
- Evaluating and improving thresholds
- **Evaluating and improving IPM programs**
- Evaluating costs and benefits
- Better understanding management decision making
- Developing useful resources

CEWIPM.org
Corn Earworm Integrated Pest Management

Evaluating and improving IPM programs

It pays to trap: Virginia Case Studies of Corn Earworm IPM on Sweet Corn

Authored by ***Brian Currin****, Graduate student, Department of Entomology, Virginia Tech;* ***Tom Kuhar****, Professor, Department of Entomology, Virginia Tech;* ***Katlyn Catron****, Postdoctoral Research Associate, Department of Entomology, Virginia Tech;* ***Hélène Doughty****, ANR Extension Agent, VCE Northampton County;* ***John Few****, VCE Powhatan County,* ***Daniel Frank****, Associate Professor Department of Entomology, Virginia Tech; and* ***Brian Nault****, Professor, Department of Entomology, Cornell University*

Published: 13 January 2025

Introduction

Corn earworm (CEW), *Helicoverpa zea* (Fig. 1) is the primary pest that drives insecticide applications by sweet corn growers in the mid-Atlantic U.S. Historically sweet corn growers have used multiple (4 to 8) insecticide applications from first silk to harvest and/or Bt transgenic sweet corn hybrids to protect their crop from damage. Managing CEW has become a greater challenge in recent years because of the development of resistance to both pyrethroids and the Bt Cry toxins found in many of the Bt transgenic corn and cotton hybrids.

Fig. 1. Corn earworm larvae in sweet corn.

Moth trapping to guide the number of sprays

CEW pest pressure varies each year. It is driven by moths' dispersal throughout the landscape and prevailing winds from southerly regions carrying moths northward. Monitoring moth activity with traps can help inform the frequency of insecticide sprays required for control (Fig. 2). This threshold-based approach has been well adopted in the northern U.S. However, CEW pest pressure is higher in more southerly locations like Virginia. Therefore, growers have not typically followed scouting guidelines, opting for scheduled sprays every 2-3 days.

AVERAGE # OF CEW MOTHS PER TRAP		Spray Interval
Moths per Day	Moths per Week	
<0.2	<1.4	No Spray
0.2-0.5	1.4-3.5	Every 5 Days
0.5-1	3.5-7	Every 4 Days
1-13	7-91	Every 3 Days
>13	>91	Every 2 Days

Fig. 2. Scentry® Heliothis trap, corn earworm moth, and action thresholds adapted from: Sweet Corn Insect Management Field Scouting Guide. https://www.northeastipm.org/neipm/assets/File/NRCS-Resources/Sweet-Corn-IPM-Field-Scouting-Guide.pdf

Developed by the Corn Earworm Working Group (CEWIPM.org). This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2023-51181-41157. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

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

CEWIPM.org
Corn Earworm Integrated Pest Management

Resources

Online Resources

It pays to trap: Virgir

Published: 13 January 2025

Webinar recording & fact sheet

CEWIPM.org
Corn Earworm Integrated Pest Management

Improving corn earworm management

- Understanding climate and resistance impacts on pressure
- Improving trapping and monitoring
- Evaluating and improving thresholds
- Evaluating and improving IPM programs
- **Evaluating costs and benefits**
- Better understanding management decision making
- Developing useful resources

CEWIPM.org
Corn Earworm Integrated Pest Management

Sweet corn economics survey results

Planted acres	Responses
<6	26
6-10	21
11-20	17
21-50	11
51-100	8
>100	8
Total	**91**

- Average yields of 900 dozen ears per acre
  - Range 100-1,800
- 20% of growers reported using Bt hybrids on 5% of total planted acres
  - With Bt planted on some of their acres

10 states responded to the economics survey, with most responses from New York and Pennsylvania

Poster

CEWIPM.org
Corn Earworm Integrated Pest Management

Improving corn earworm management

- Understanding climate and resistance impacts on pressure
- Improving trapping and monitoring
- Evaluating and improving thresholds
- Evaluating and improving IPM programs
- Evaluating costs and benefits
- **Better understanding management decision making**
- Developing useful resources

New project team member

Colby Silvert – University of Maryland

Expertise: Nonformal education, program planning and evaluation, innovation adoption in specialty agri-food systems, trained as a social scientist and a horticulturalist

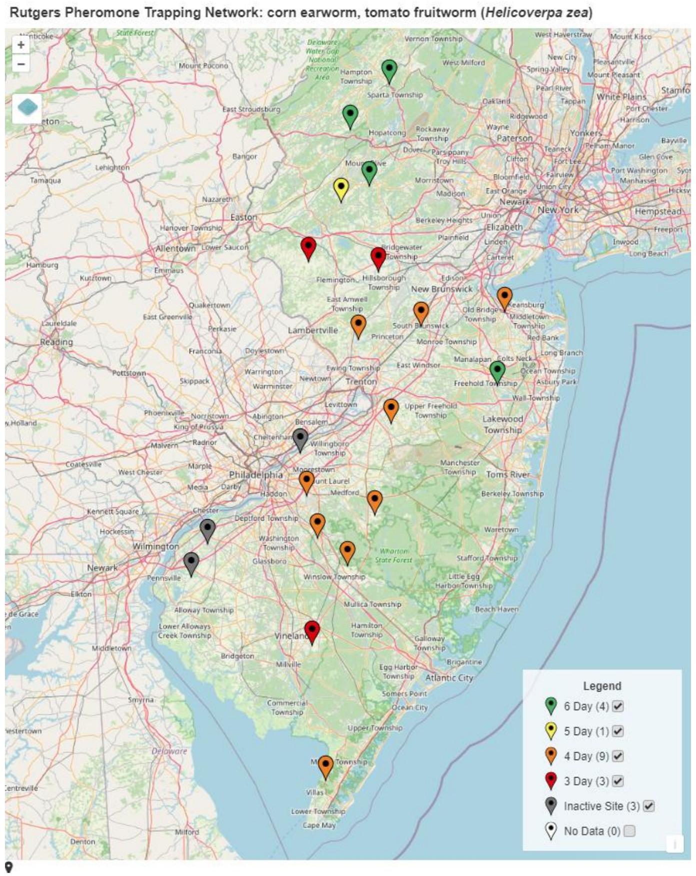
Presentation

CEWIPM.org
Corn Earworm Integrated Pest Management

Improving corn earworm management

- Understanding climate and resistance impacts on pressure
- Improving trapping and monitoring
- Evaluating and improving thresholds
- Evaluating and improving IPM programs
- Evaluating costs and benefits
- Better understanding management decision making
- **Developing useful resources**

EDDMapS for corn earworm captures



- 45 project site years of data
- 5,646 site years total in database

Southern IPM Center

CEWIPM.org
Corn Earworm Integrated Pest Management

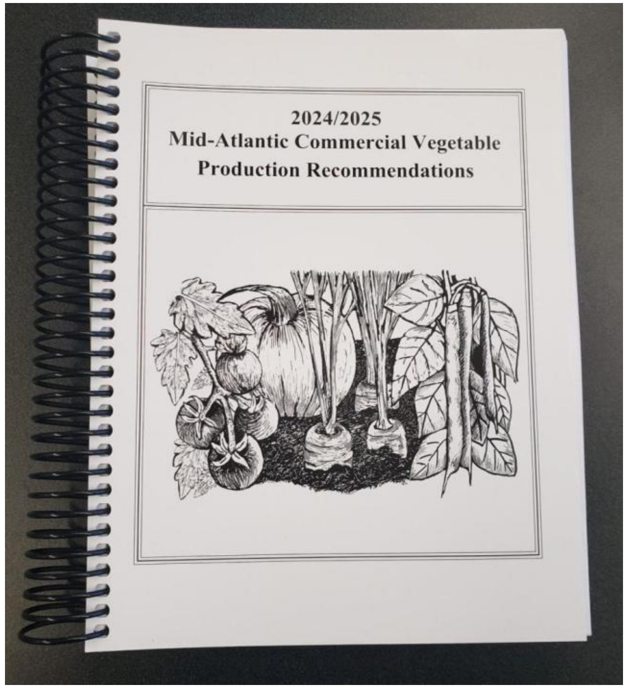
One stop shop for existing & new resources

Southern IPM Center

Northeastern IPM Center

CEWIPM.org
Corn Earworm Integrated Pest Management

Next steps and resources



It pays to trap: Virginia Case Studies of Corn Earworm IPM on Sweet Corn

Authored by ***Brian Currin****, Graduate student, Department of Entomology, Virginia Tech;* ***Tom Kuhar****, Professor, Department of Entomology, Virginia Tech;* ***Katlyn Catron****, Postdoctoral Research Associate, Department of Entomology, Virginia Tech;* ***Hélène Doughty****, ANR Extension Agent, VCE Northampton County;* ***John Few****, VCE Powhatan County,* ***Daniel Frank****, Associate Professor Department of Entomology, Virginia Tech; and* ***Brian Nault****, Professor, Department of Entomology, Cornell University*

Published: 13 January 2025

Introduction

Corn earworm (CEW), *Helicoverpa zea* (Fig. 1) is the primary pest that drives insecticide applications by sweet corn growers in the mid-Atlantic U.S. Historically sweet corn growers have used multiple (4 to 8) insecticide applications from first silk to harvest and/or Bt transgenic sweet corn hybrids to protect their crop from damage. Managing CEW has become a greater challenge in recent years because of the development of resistance to both pyrethroids and the Bt Cry toxins found in many of the Bt transgenic corn and cotton hybrids.

Fig. 1. Corn earworm larvae in sweet corn.

Moth trapping to guide the number of sprays

CEW pest pressure varies each year. It is driven by moths' dispersal throughout the landscape and prevailing winds from southerly regions carrying moths northward. Monitoring moth activity with traps can help inform the frequency of insecticide sprays required for control (Fig. 2). This threshold-based approach has been well adopted in the northern U.S. However, CEW pest pressure is higher in more southerly locations like Virginia. Therefore, growers have not typically followed scouting guidelines, opting for scheduled sprays every 2-3 days.

AVERAGE # OF CEW MOTHS PER TRAP		Spray Interval
Moths per Day	Moths per Week	
<0.2	<1.4	No Spray
0.2-0.5	1.4-3.5	Every 5 Days
0.5-1	3.5-7	Every 4 Days
1-13	7-91	Every 3 Days
>13	>91	Every 2 Days

Fig. 2. Scentry® Heliothis trap, corn earworm moth, and action thresholds adapted from: Sweet Corn Insect Management Field Scouting Guide. https://www.northeastipm.org/neipm/assets/File/NRCS-Resources/Sweet-Corn-IPM-Field-Scouting-Guide.pdf

Developed by the Corn Earworm Working Group (CEWIPM.org). This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2023-51181-41157. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

USDA National Institute of Food and Agriculture

MyIPM for Vegetables

Presentation

Improving corn earworm management

- Understanding climate and resistance impacts on pressure
- Improving trapping and monitoring
- Evaluating and improving thresholds
- Evaluating and improving IPM programs
- Evaluating costs and benefits
- Better understanding management decision making
- Developing useful resources

CEWIPM.org
Corn Earworm Integrated Pest Management

NIFA acknowledgement

This work is supported by the Specialty Crop Research Initiative program [grant no. 2023-51181-41157/project accession no. 1031455], from the U.S. Department of Agriculture's National Institute of Food and Agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and should not be construed to represent any official USDA or U.S. Government determination or policy.

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

Heliothis vs. Hartstack: Trap comparison in Suffolk County, NY

Jared Dyer and Daniel Gilrein

Cornell Cooperative Extension of Suffolk County

jd852@cornell.edu

CEWIPM.org

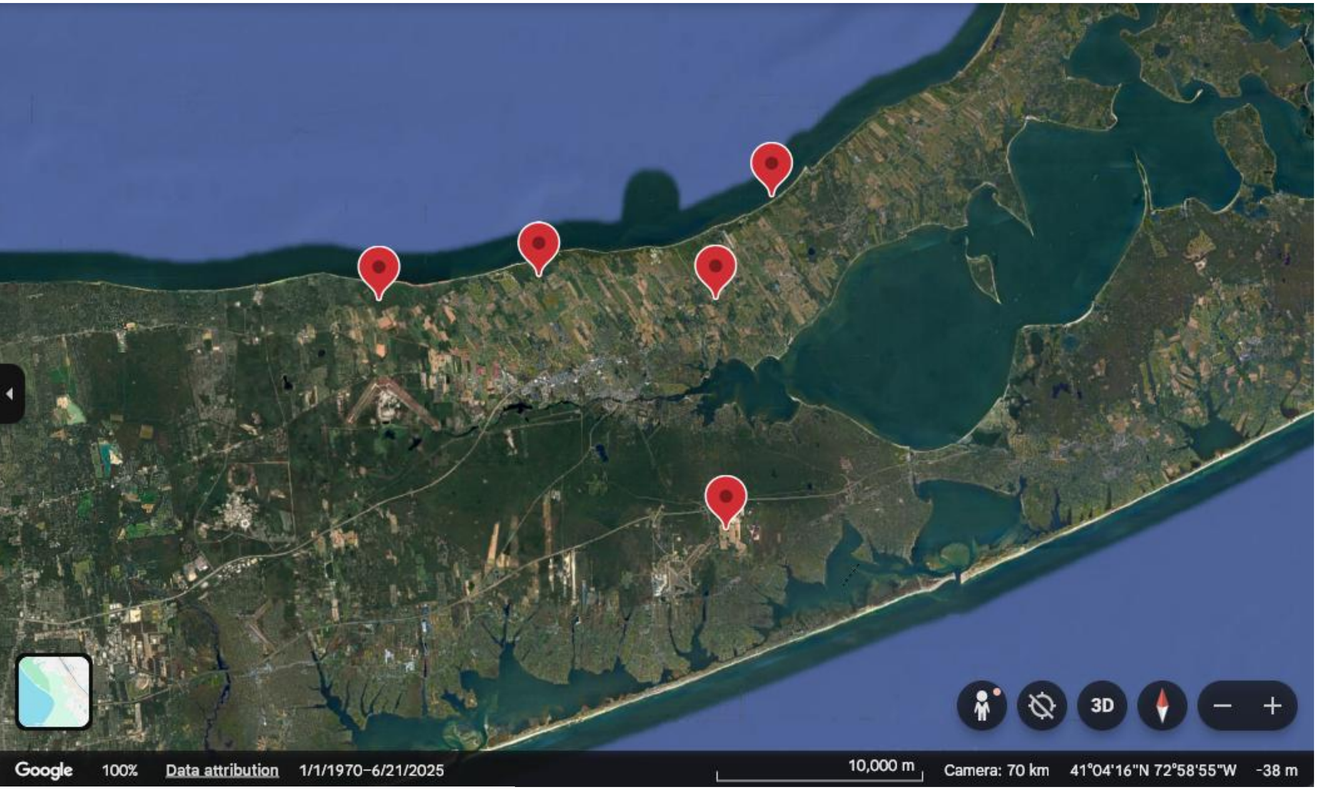
Heliothis vs. Hartstack: Background

- Trap counts are crucial for CEW management
- Mahas et al. (2025) compared trap type and lure combos
- Hartstack + Hercon superior
- How do the Hartstack and Heliothis compare over time?

CEWIPM.org
Corn Earworm Integrated Pest Management

Heliothis vs. Hartstack: Methods

Suffolk County, New York, 2024



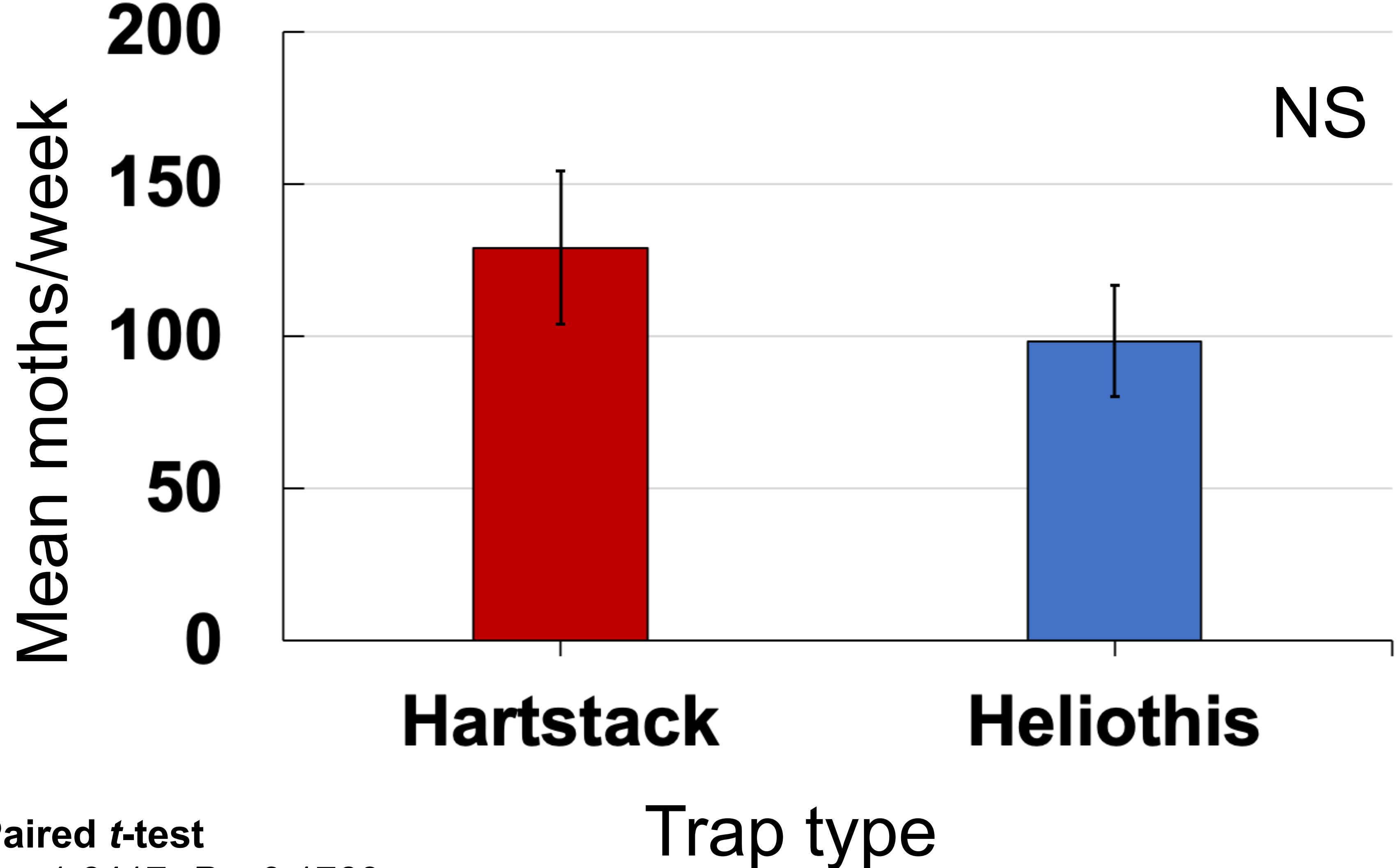
- 5 Hartstack-Heliothis pairs w/ Hercon lure
- Deployed mid-July
- Moved regularly to be within silking corn
- Checked weekly until no more silking corn

CEWIPM.org
Corn Earworm Integrated Pest Management

Heliothis vs. Hartstack: Results

Location	Start Date	End Date	Total weeks	Total weeks counted*	Total moths counted	Mean moths/week
East Quogue	July 16, 2024	September 11, 2024	8	5	1394	174.3
Jamesport	July 17, 2024	August 28, 2024	6	4	1285	142.8
Mattituck	July 15, 2024	August 28, 2024	6	6	1203	109.4
Riverhead	July 15, 2024	October 29, 2024	15	15	1663	57.3
Wading River	July 17, 2024	October 29, 2024	15	15	2505	83.5

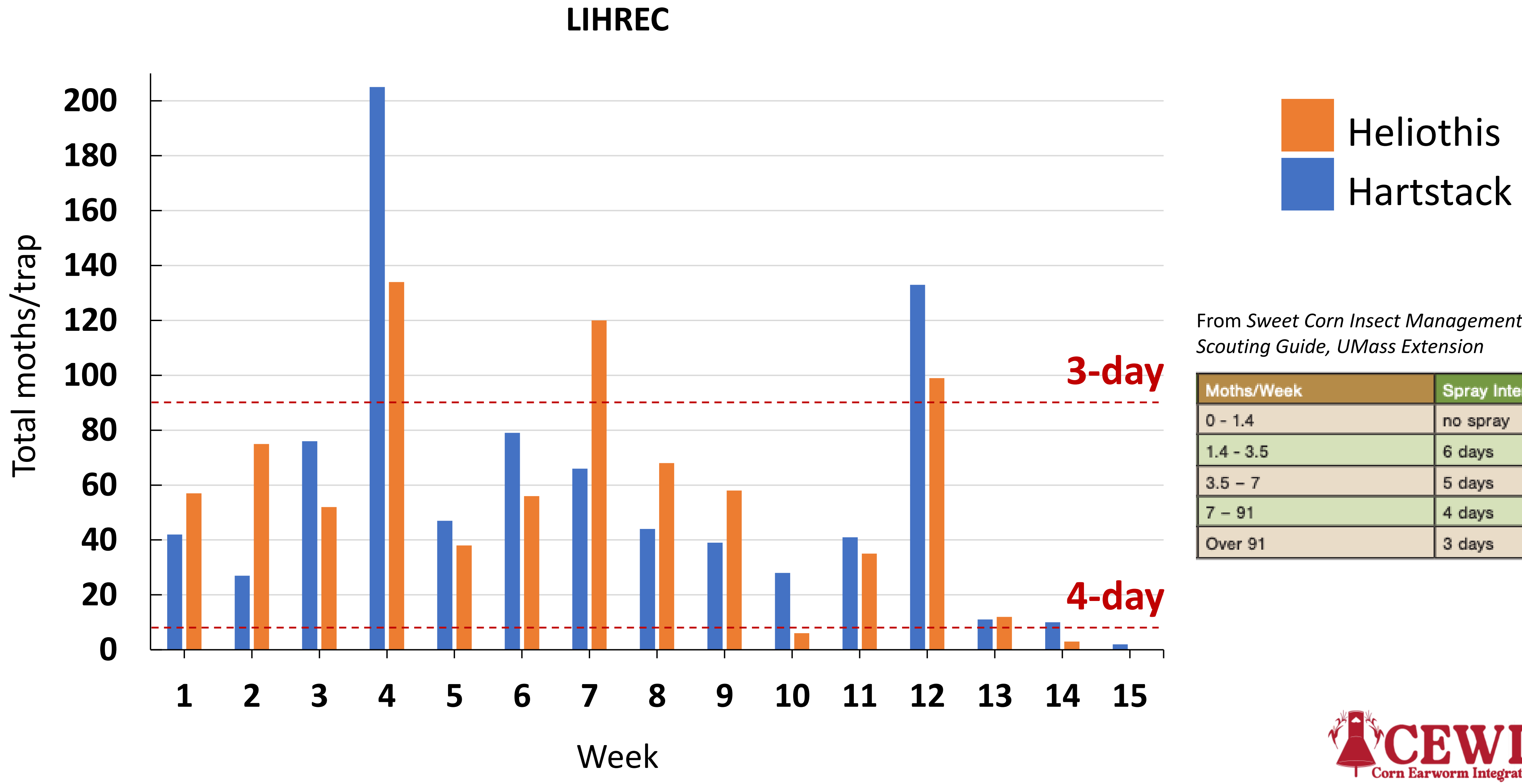
Heliothis vs. Hartstack: Results



Paired *t*-test
$t_4 = 1.6417$, $P = 0.1760$

CEWIPM.org
Corn Earworm Integrated Pest Management

Heliothis vs. Hartstack: Results

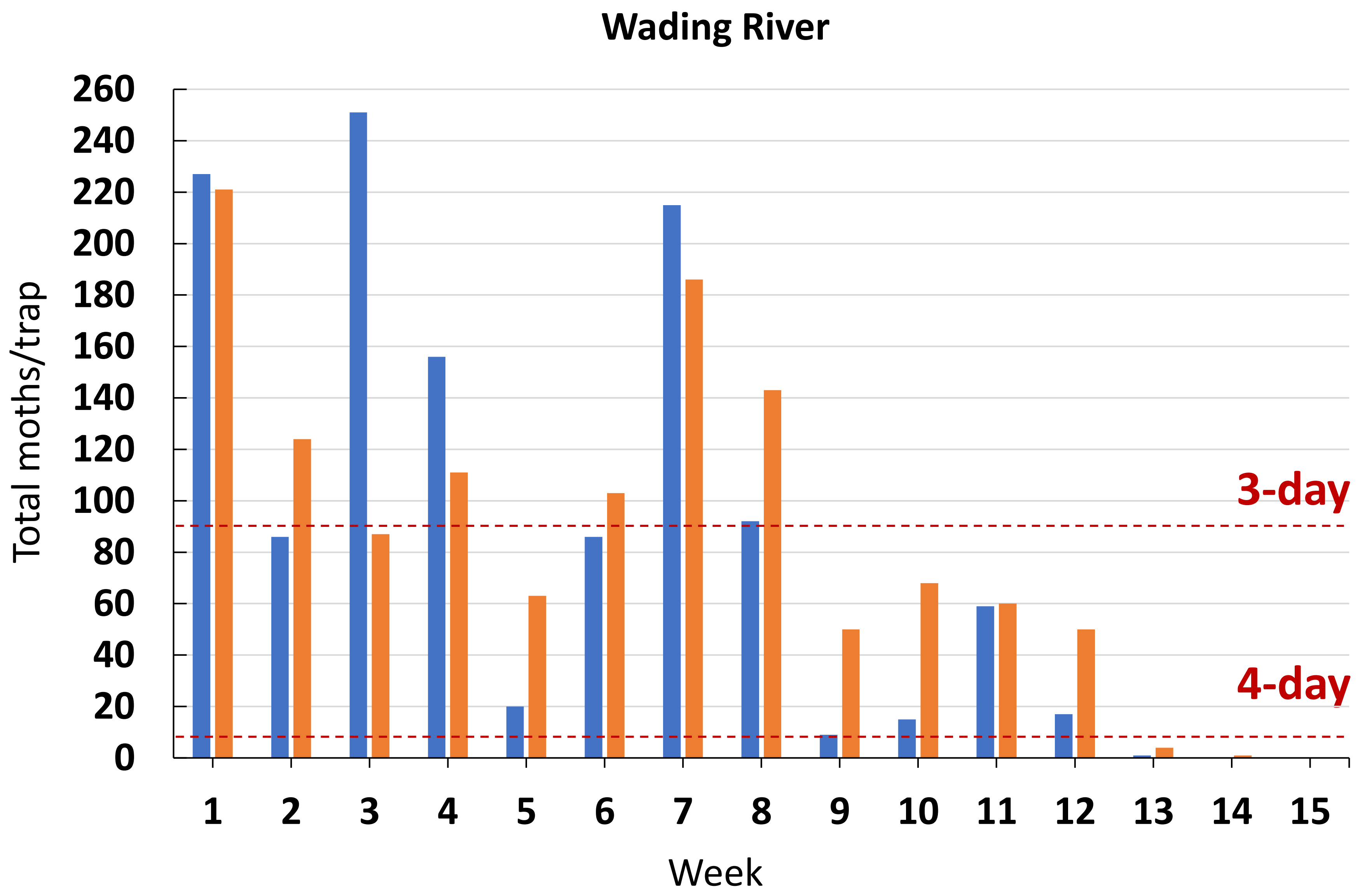


From *Sweet Corn Insect Management Field Scouting Guide, UMass Extension*

Moths/Week	Spray Interval
0 - 1.4	no spray
1.4 - 3.5	6 days
3.5 – 7	5 days
7 – 91	4 days
Over 91	3 days

CEWIPM.org
Corn Earworm Integrated Pest Management

Heliothis vs. Hartstack: Results



Heliothis
Hartstack

From *Sweet Corn Insect Management Field Scouting Guide, UMass Extension*

Moths/Week	Spray Interval
0 - 1.4	no spray
1.4 - 3.5	6 days
3.5 – 7	5 days
7 – 91	4 days
Over 91	3 days

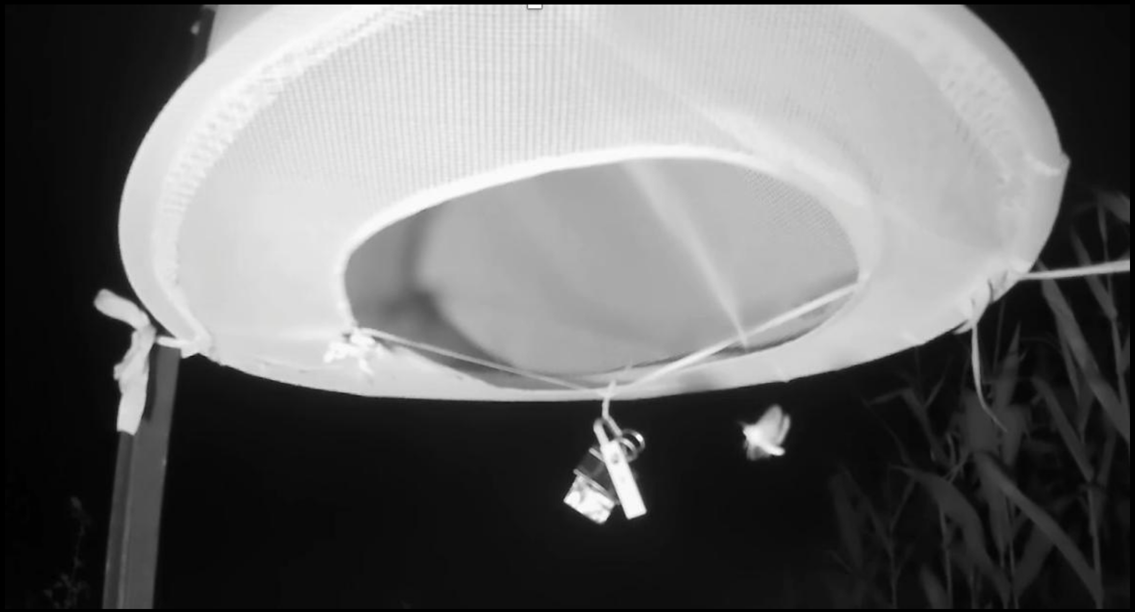
CEWIPM.org
Corn Earworm Integrated Pest Management

Heliothis vs. Hartstack: Conclusions

- No significant difference in moths/week
- Sensitivity to low pop
- Traps frequently disturbed
- Trap placement: Inside vs. Outside corn field?

CEWIPM.org
Corn Earworm Integrated Pest Management

CEW flight behavior informs lure placement and trap design



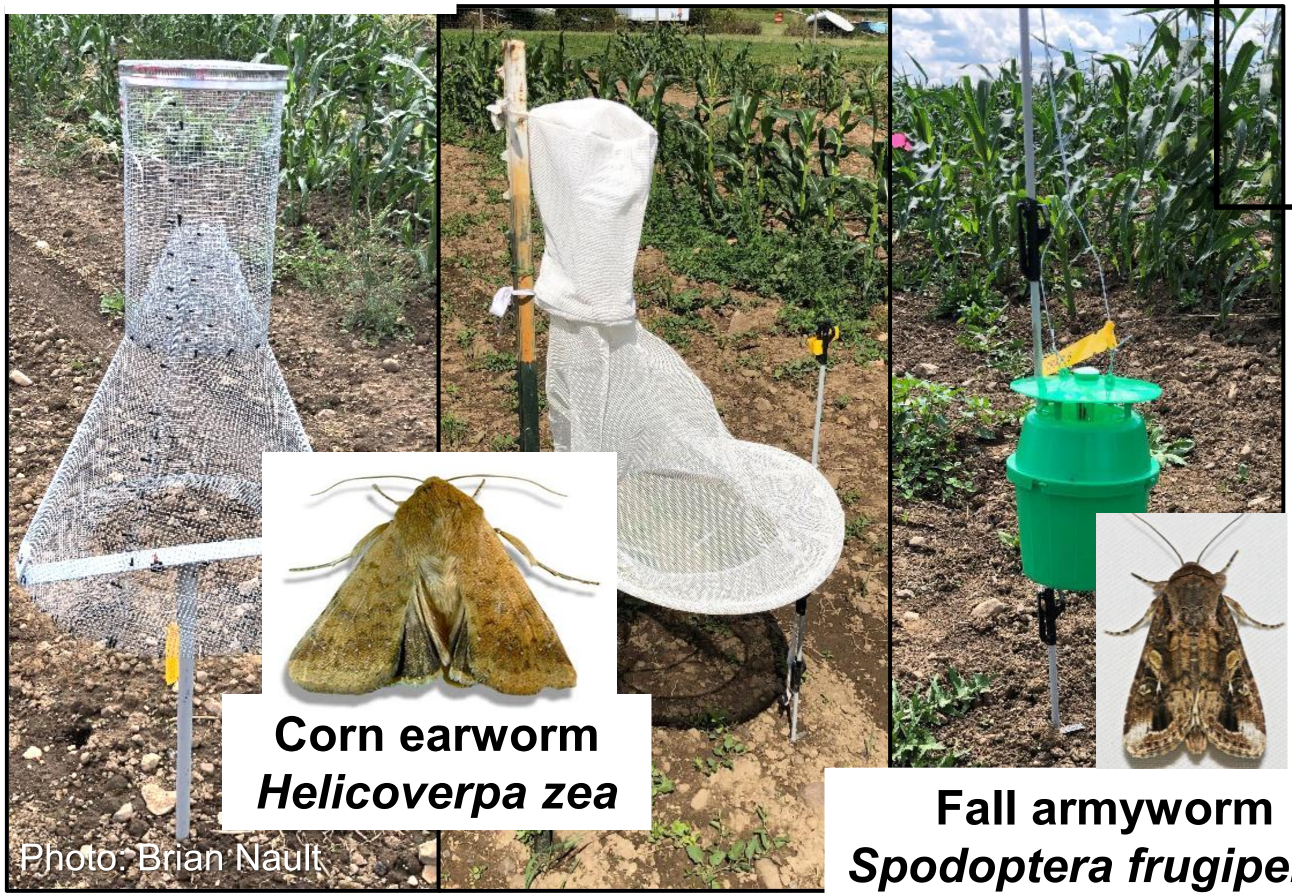
Christophe Duplais
Department of Entomology, Cornell AgriTech
Cornell University
c.duplais@cornell.edu

TRAP DIVERSITY

Hartstack "Texas" style cone trap
J. Econ. Entomol. 1979, 72, 519-522.

Scentry® Heliothis

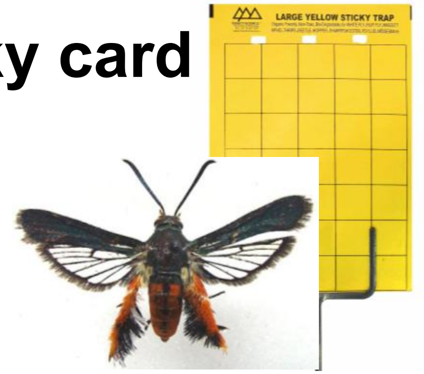
Bucket



Corn earworm
Helicoverpa zea

Fall armyworm
Spodoptera frugiperda

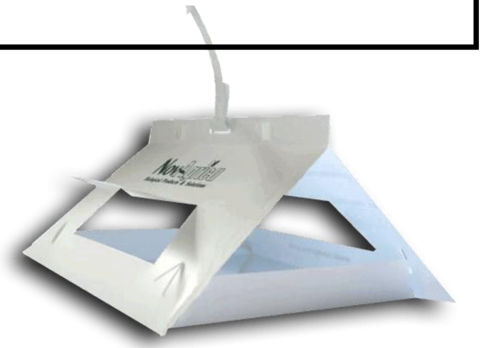
Sticky card



Squash vine borer
Melittia cucurbitae

Codling moth
Cydia pomonella

Delta traps



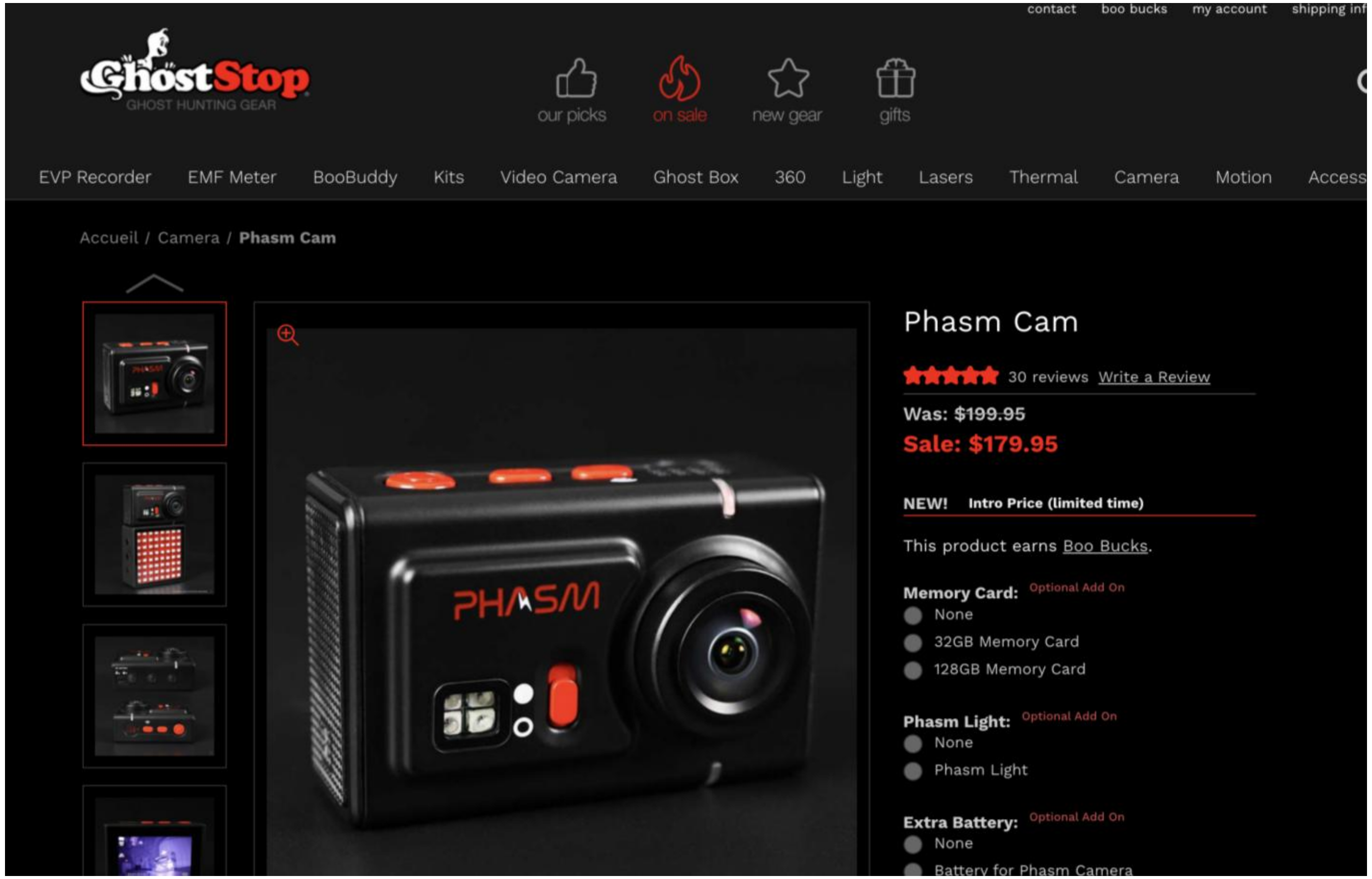
CEWIPM.org
Corn Earworm Integrated Pest Management

GHOST HUNTER GEAR

https://www.ghoststop.com/

GhostStop®
Ghost Hunting Equipment

Ghost hunters infrared camera!



CEWIPM.org
Corn Earworm Integrated Pest Management

MOTH HUNTING

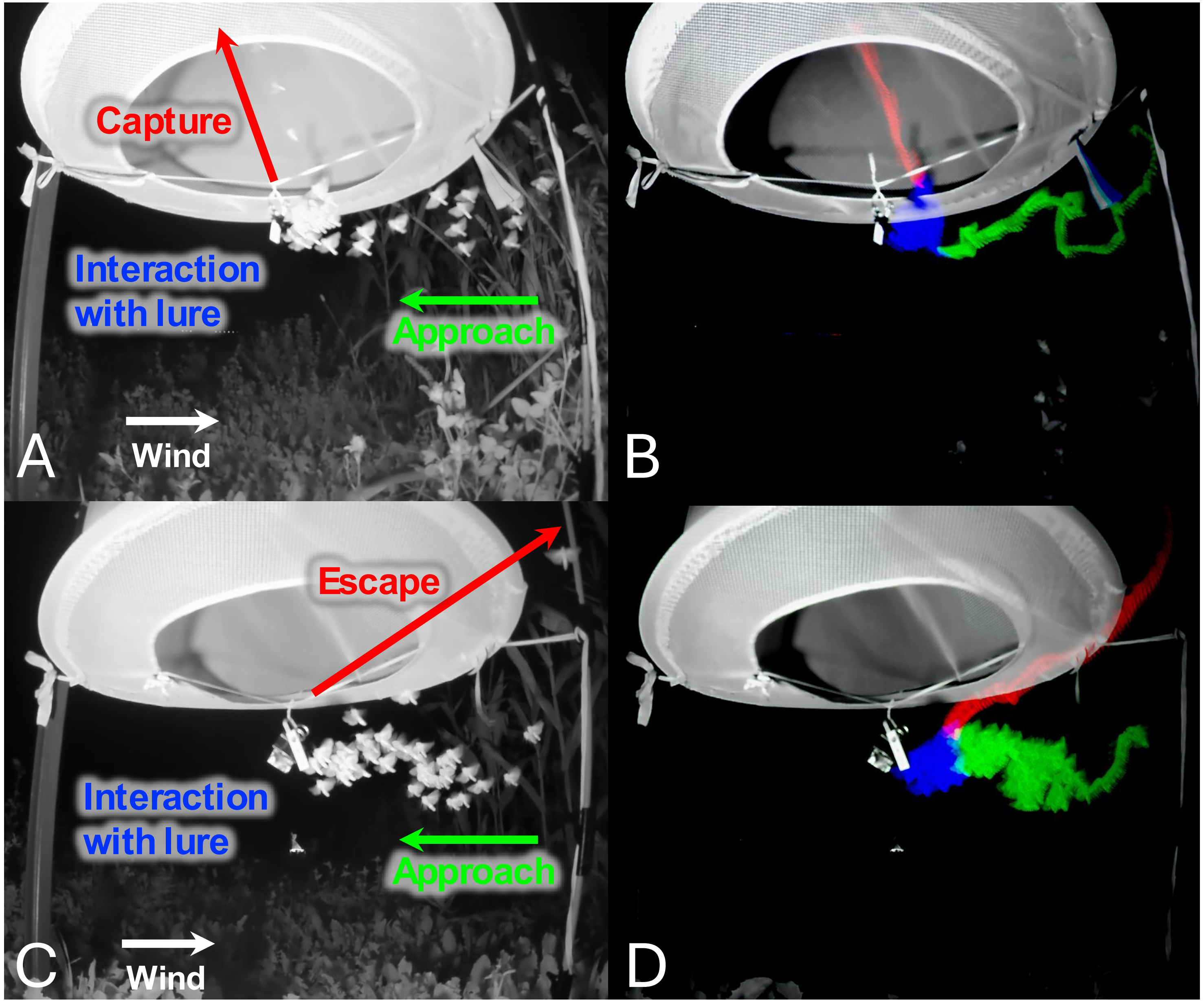
~ $300

CEWIPM.org
Corn Earworm Integrated Pest Management

CEW SUCCESSFUL TRAPPING

CEW FAILED TRAPPING

TRACKING FLIGHT BEHAVIOR



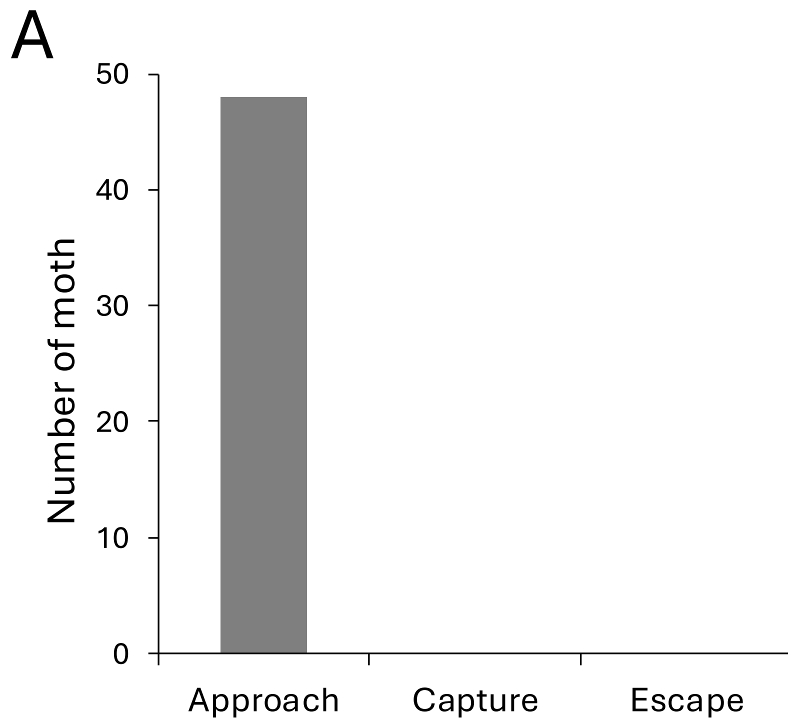
FAW VIDEOS

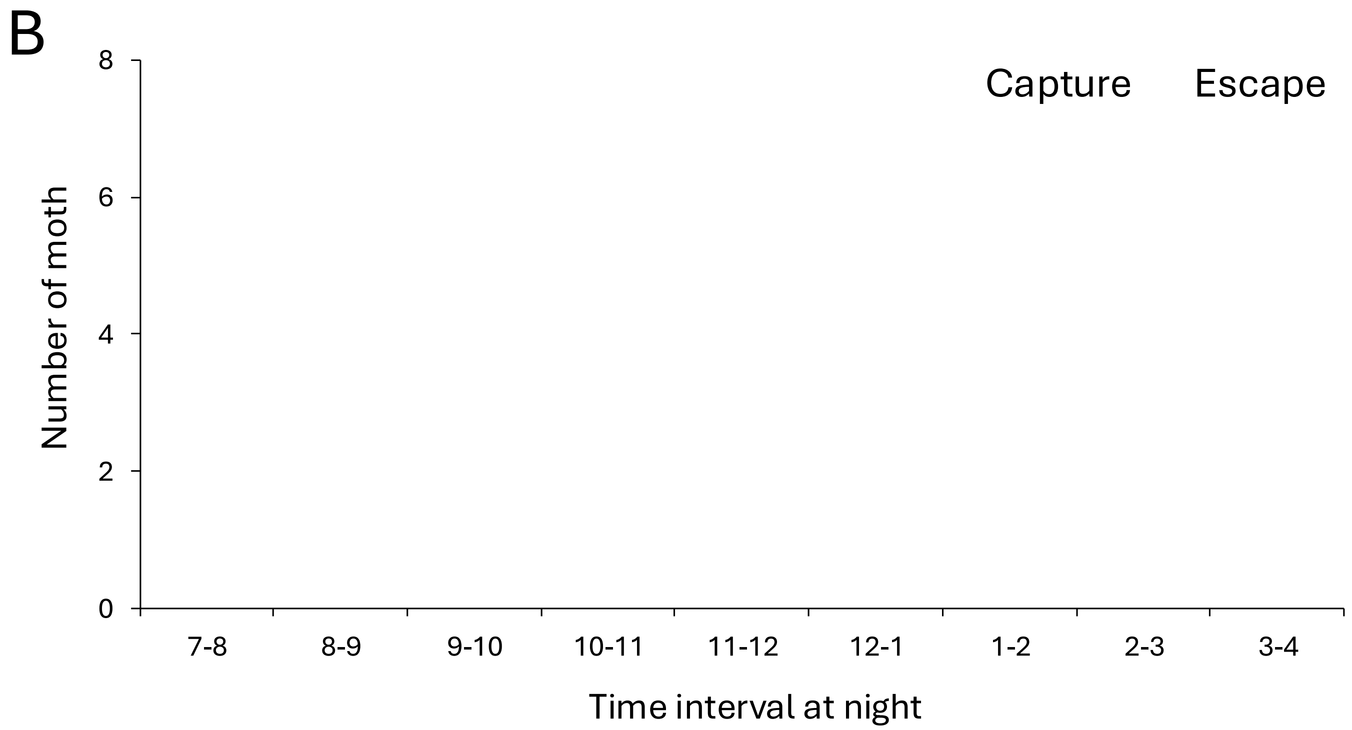
CEW PRELIMINARY RESULTS

1 night, 2 cameras

47 approaches, **12 trapped**

25% trapping rate?

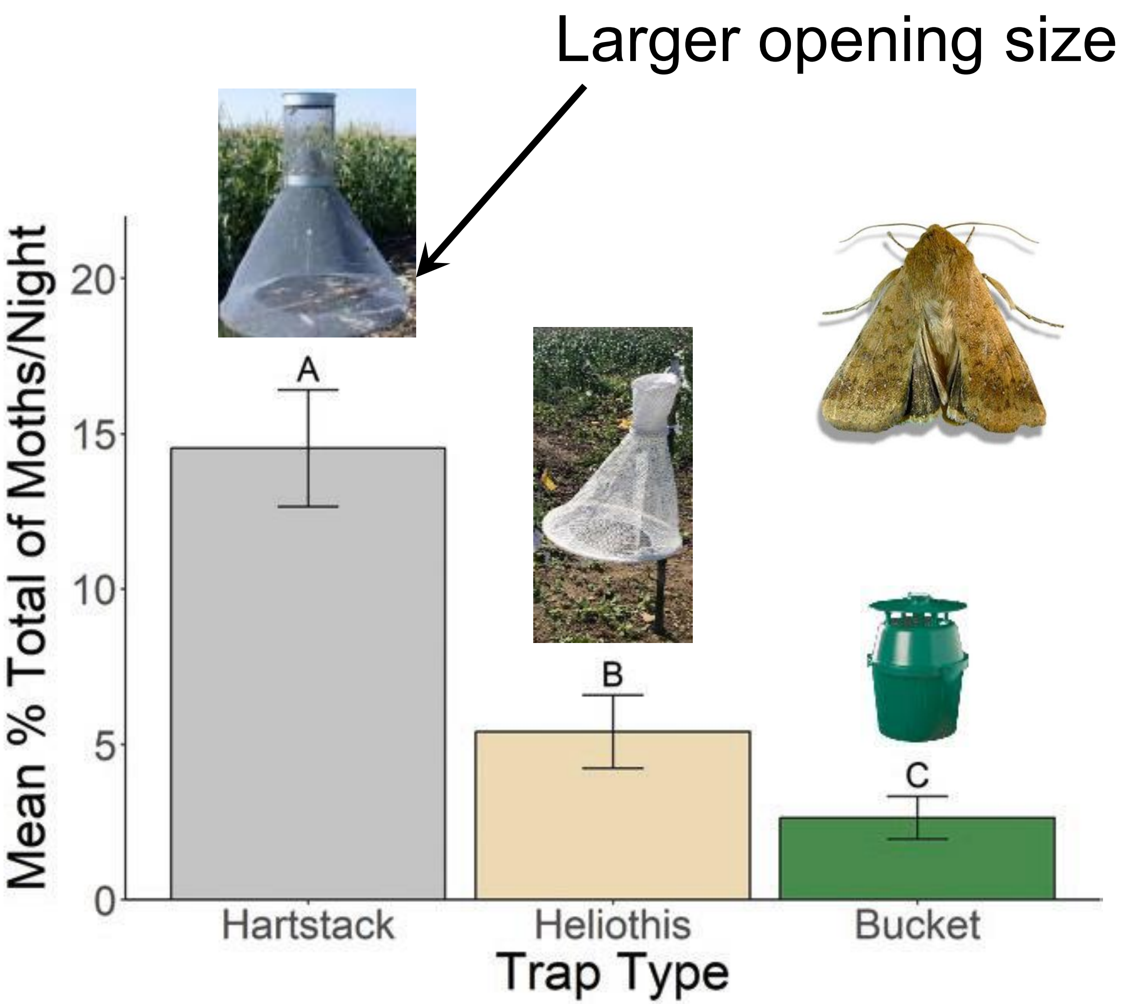


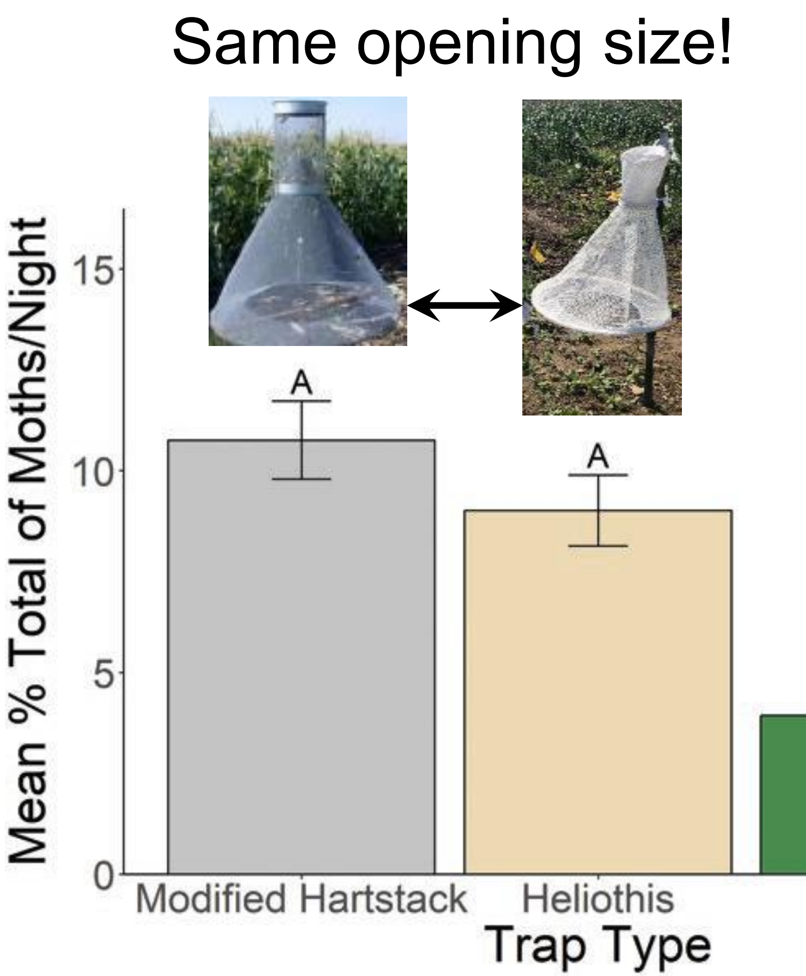


CEWIPM.org
Corn Earworm Integrated Pest Management

TRAP FOR CEW

2022-2023; >30,000 CEW



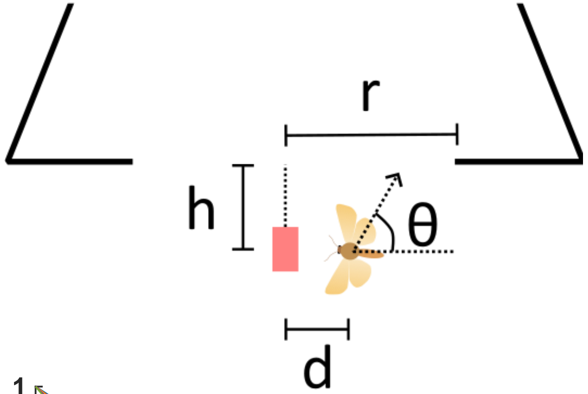


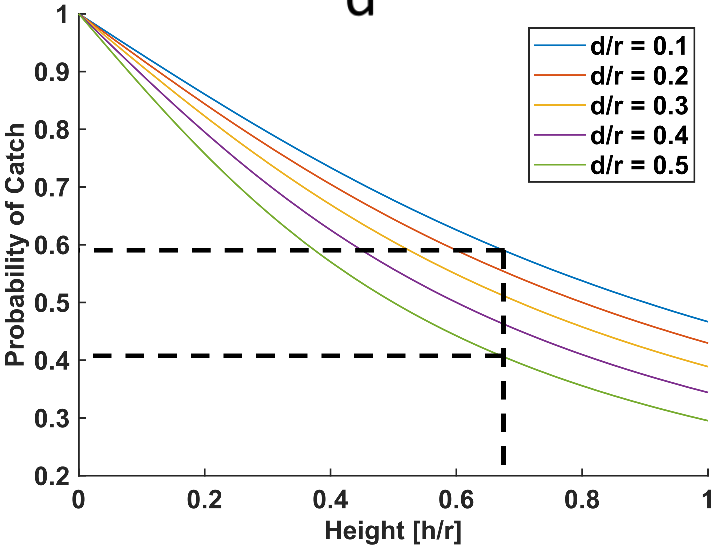
CEWIPM.org
Corn Earworm Integrated Pest Management

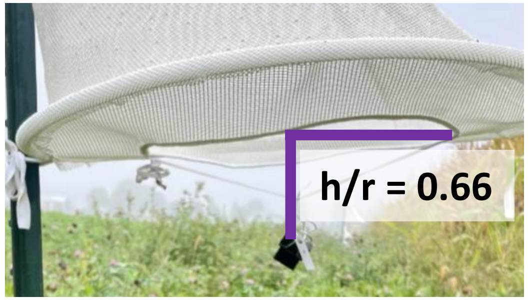
Mahas, Duplais, Hamby, Dively, Huseth, Owens, Kuhar, Doughtry, Currin, Nault (2025) *Journal of Economic Entomology* 118(5), 2460-2467.

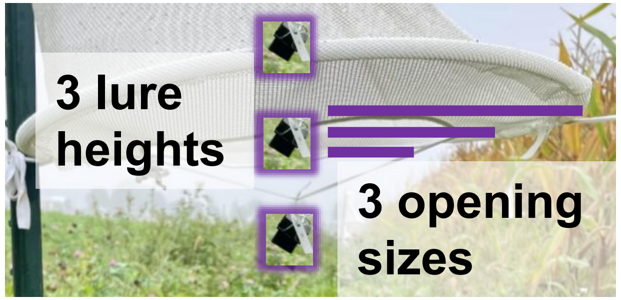
TESTING CHRIS ROH'S MODEL

Chris Roh
BEE, Cornell





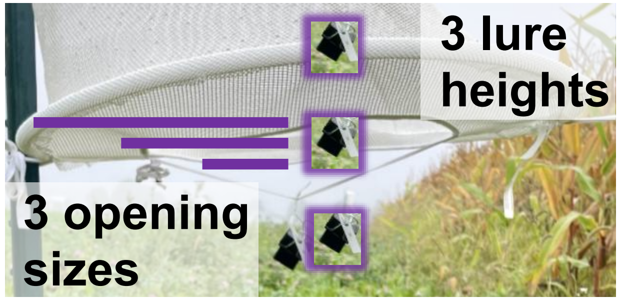




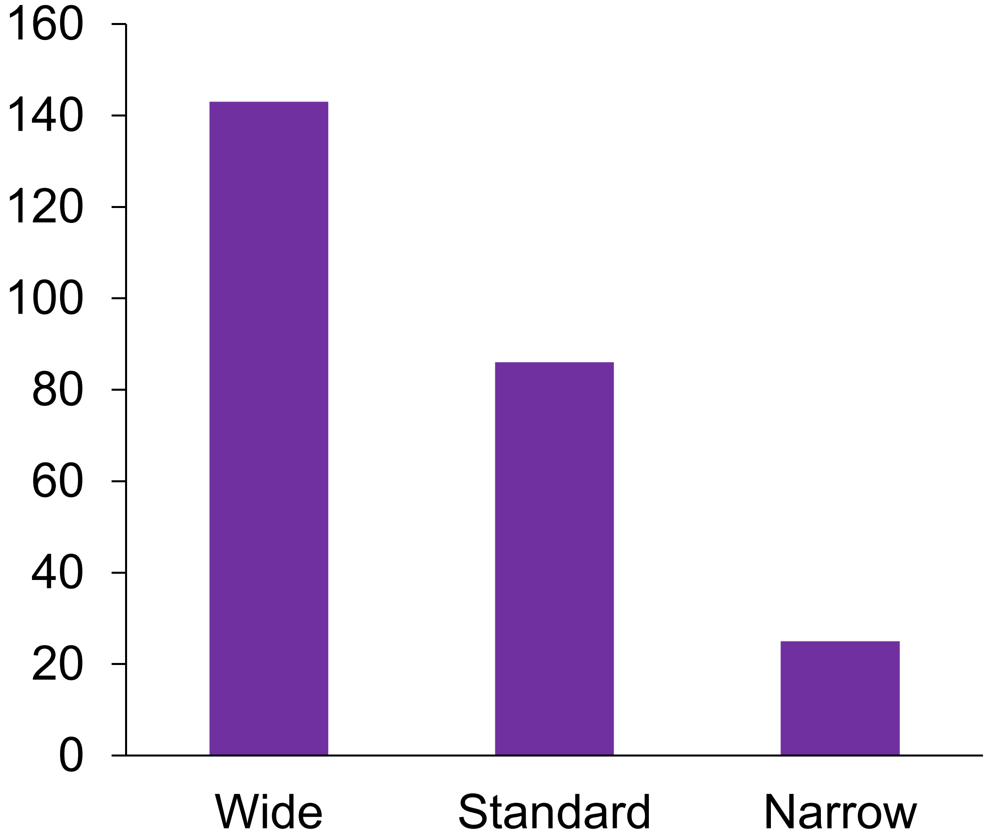
2025-2026, 3 states (NY, PA with Heather Grab)
- **Catch count + Escape count/video**

CEWIPM.org
Corn Earworm Integrated Pest Management

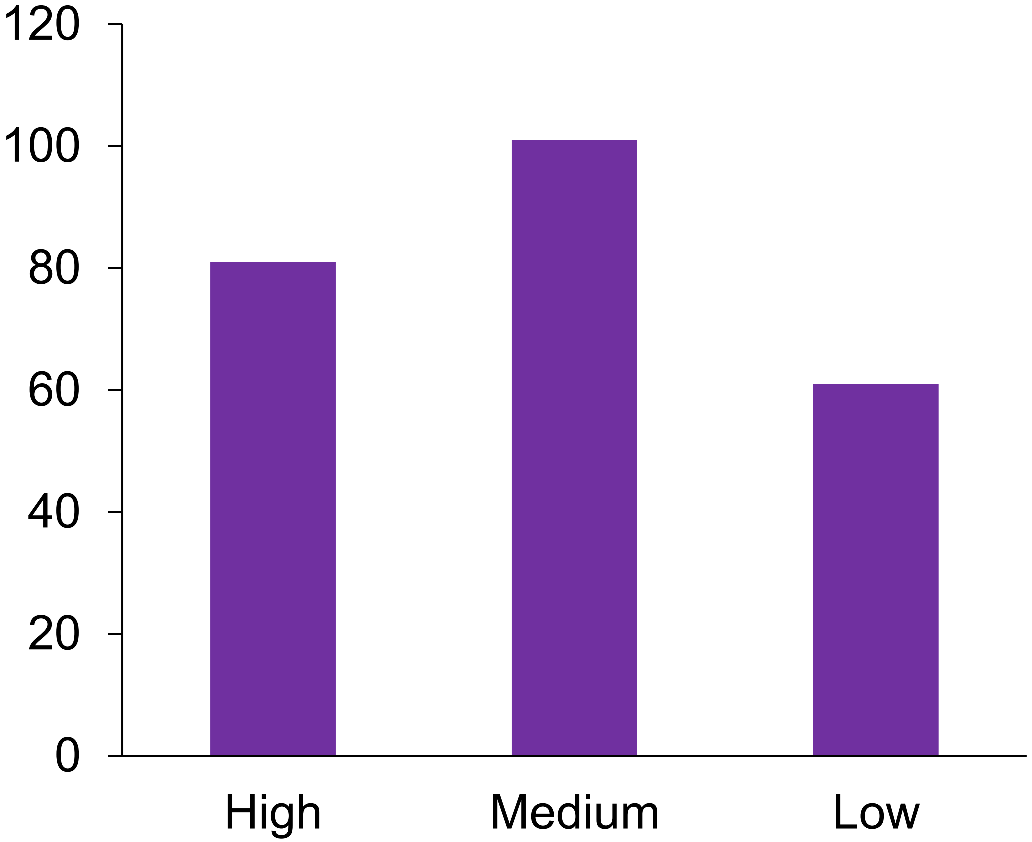
PRELIMINARY RESULTS



Total CEW Caught in 2025 for Different Trap Opening Sizes



Total CEW Caught in 2025 for Different Trap Lure Heights



DISPENSER SHAPE AND AGING

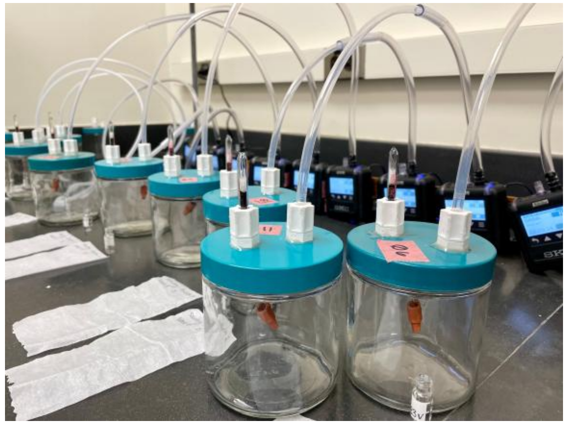
Hercon® 2.5 mg

(Leonhardt & Moreno 1982) USDA, Beltsville, MD

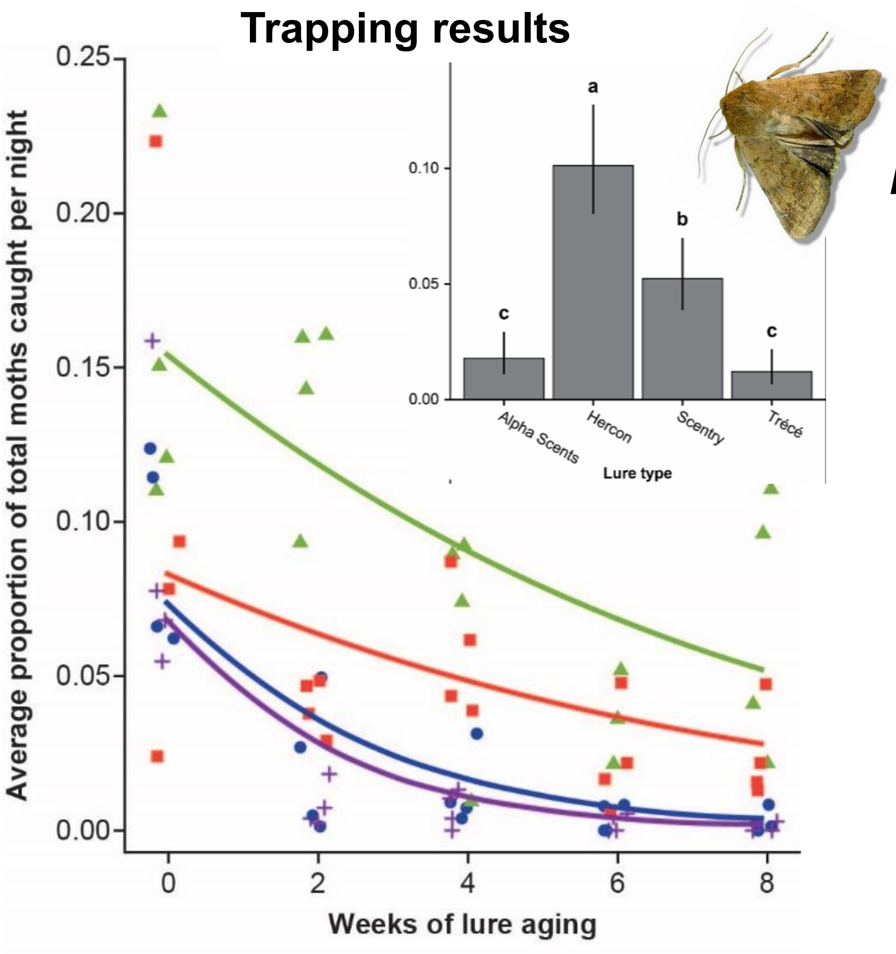
Scentry 5 mg

Trécé® 3 mg

Alpha Scents 3 mg

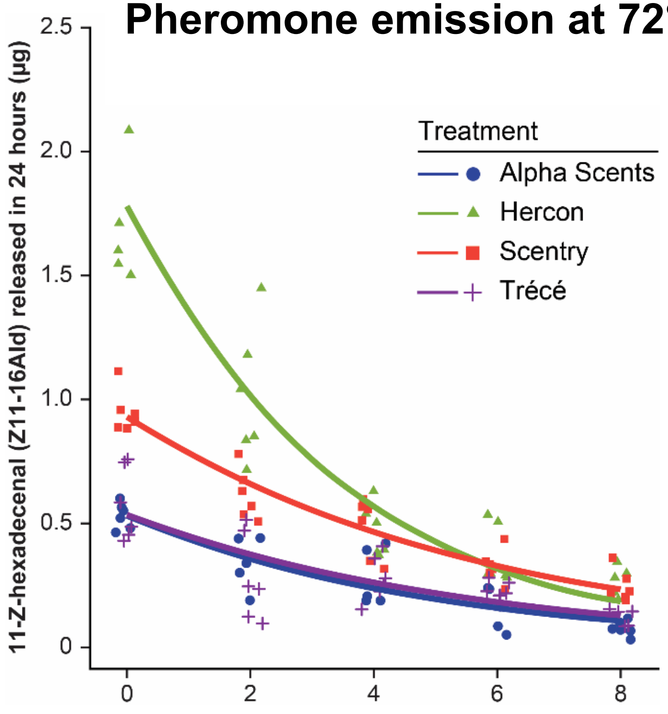


Trapping results

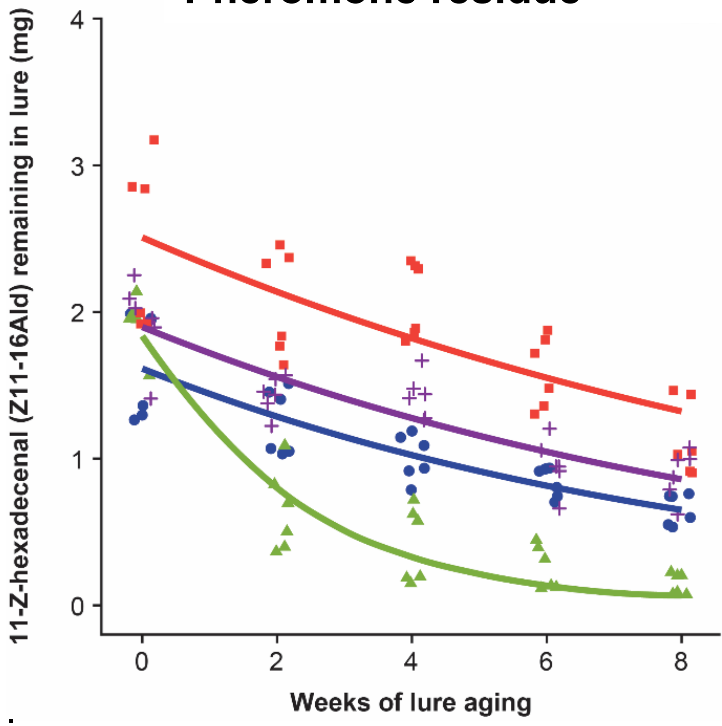


Corn earworm
Helicoverpa zea

Pheromone emission at 72°F



Pheromone residue

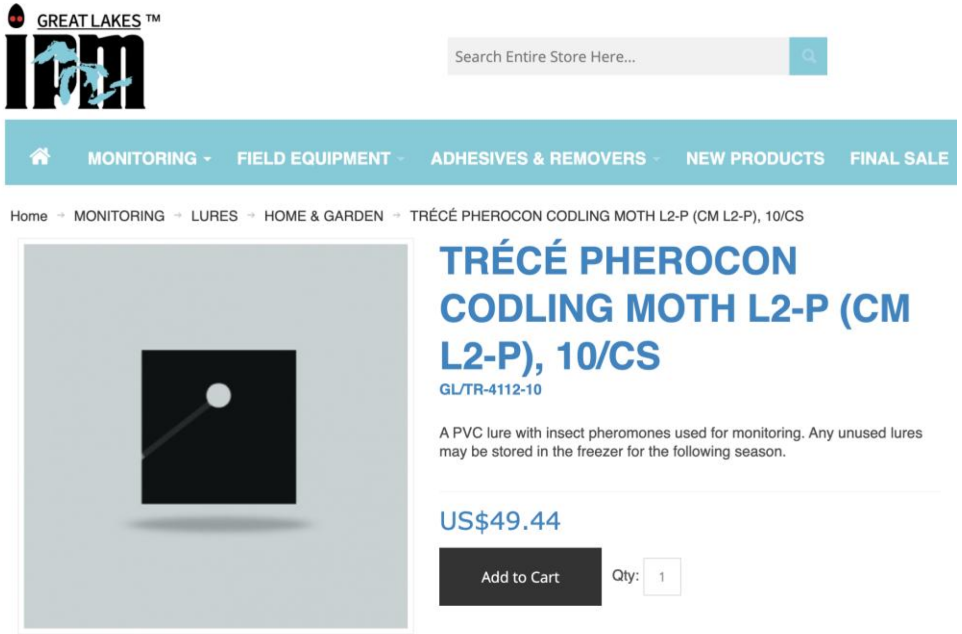


Huseth, Duplais, Panta, Jakhmola, Seybert, Nault (2025) *Journal of Economic Entomology,* 118 (6), 3224-3231.

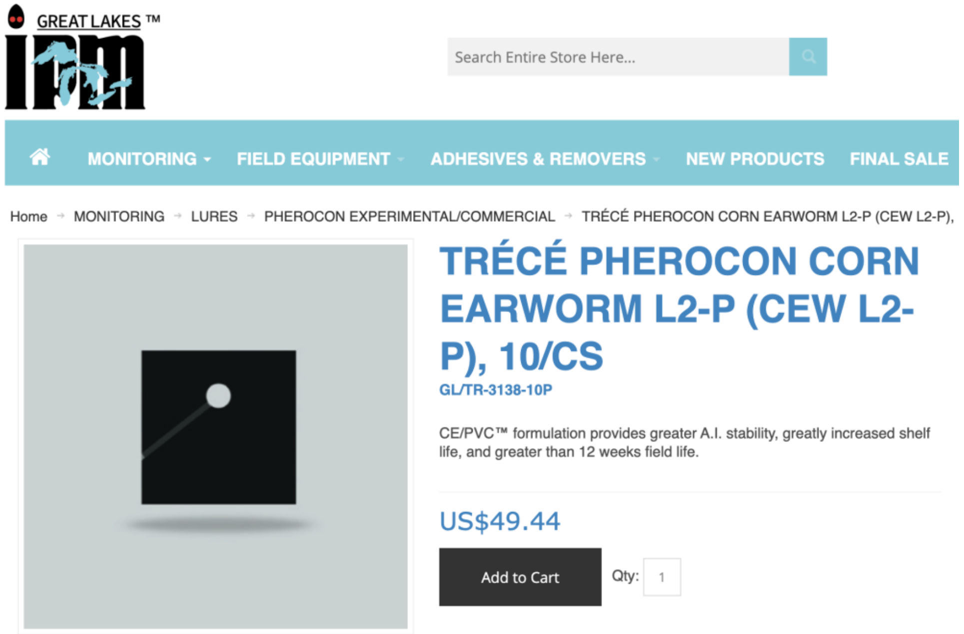
POSSIBLE SHIFT IN THE LURE INDUSTRY

TRÉCÉ INCORPORATED

Trécé mating disruption dispenser for Codling Moth and Oriental Fruit Moth



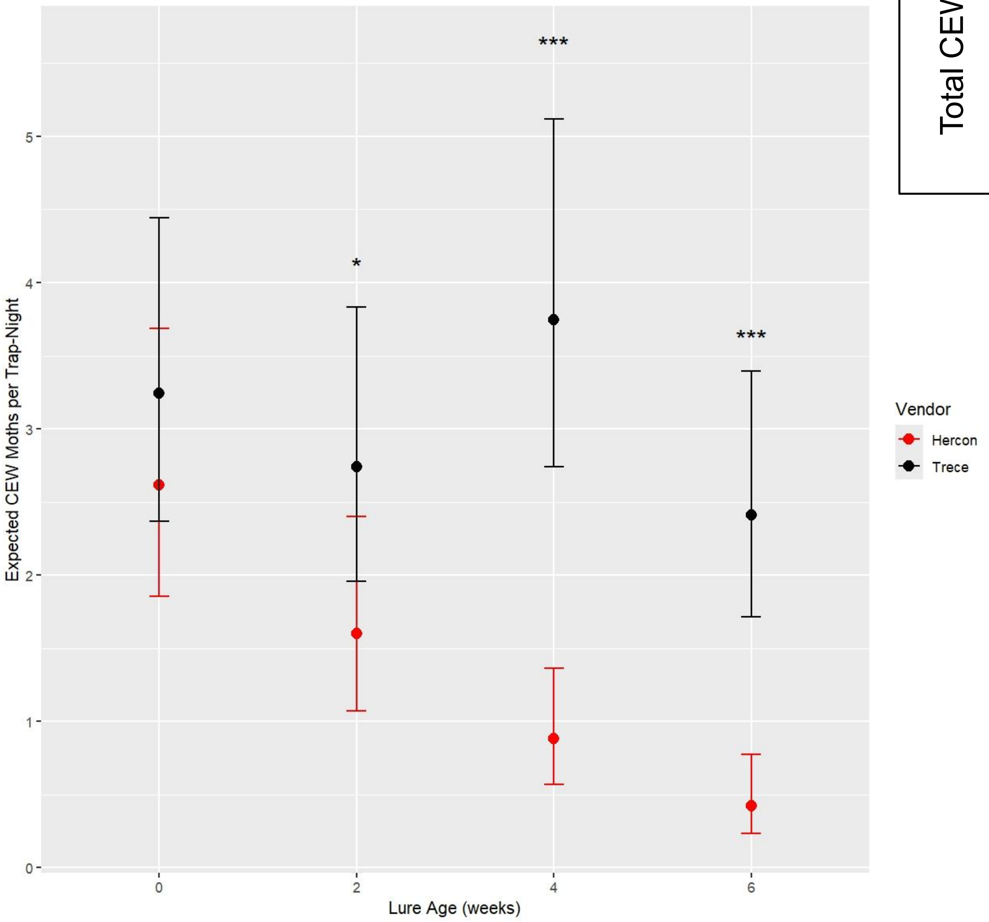
Launched in 2023

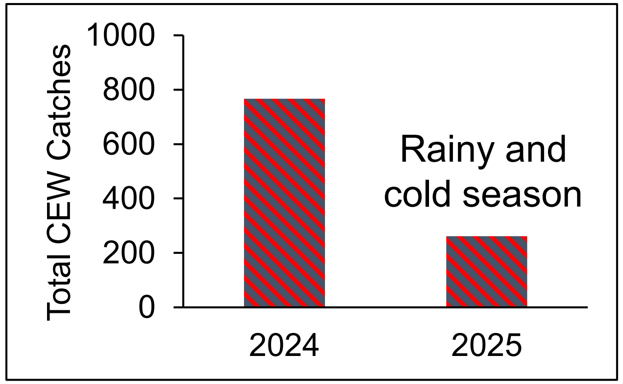


Launched in March 2025
2024-2025 longevity trials after 1, 2, or 3 months of aging

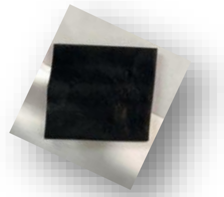
CEWIPM.org Corn Earworm Integrated Pest Management

TRECE LURE TRAPS MORE OVER 3 MONTHS

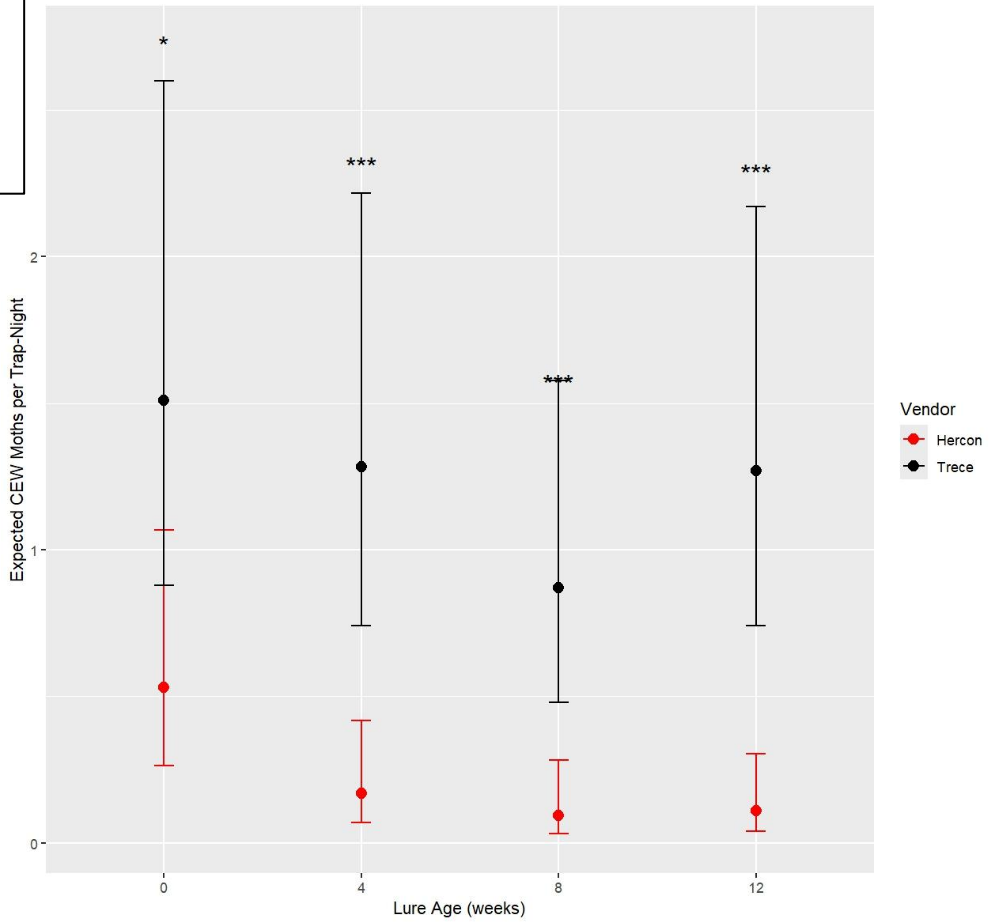




Hercon



Trece

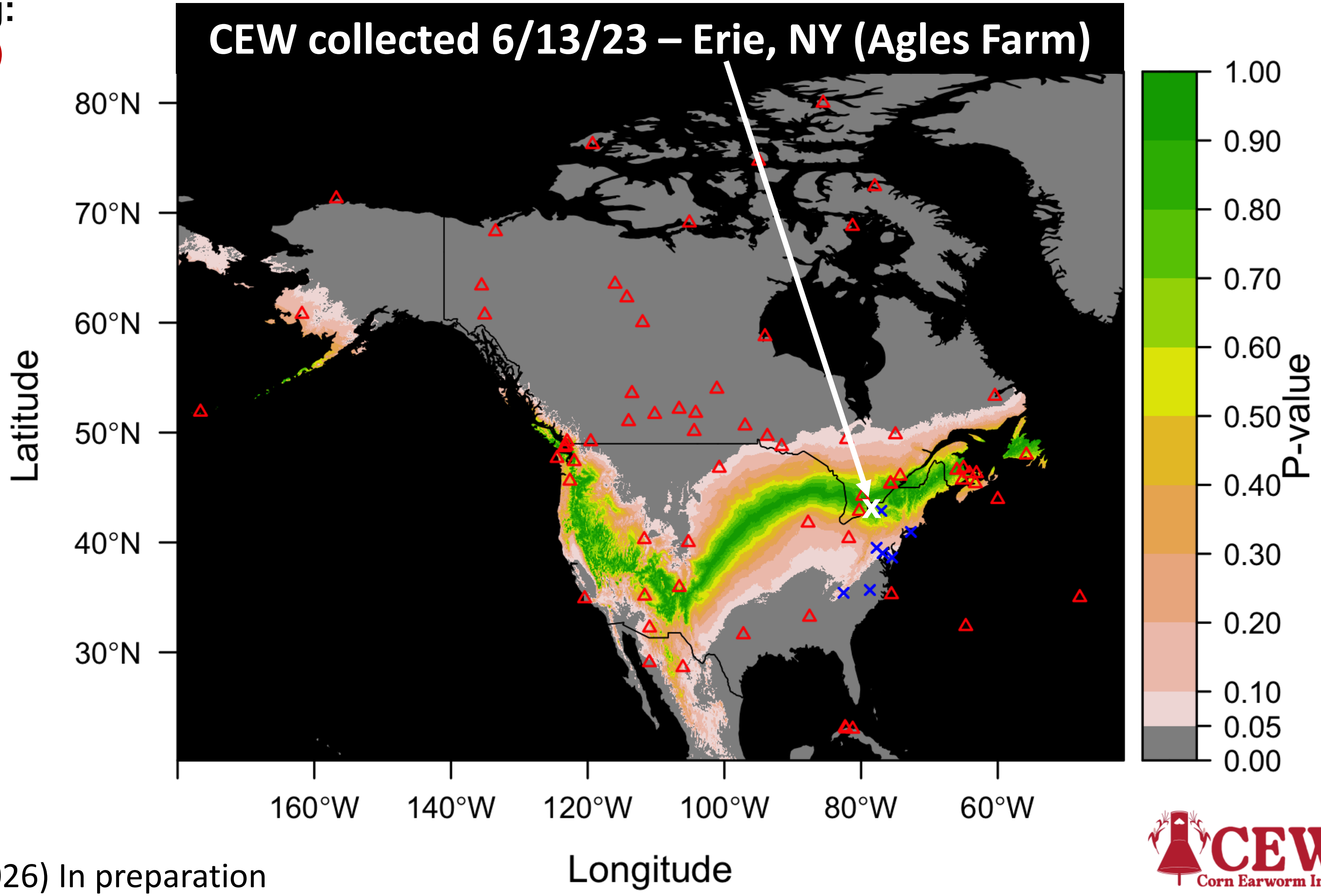


CEWIPM.org
Corn Earworm Integrated Pest Management

OVERWINTERING SITE

Currently processing:
78 samples (5 states) 2023, 2024 (warm winters)

More to analyze:
~100 samples (8 states) 2025 (cold winter), 2026?



Bukola Molake, et al. (2026) In preparation

CEWIPM.org Corn Earworm Integrated Pest Management

THANK YOU

USDA SCRI grant
Hatch grant

Brian Nault

John Mahas

Kanika Jakhmola, Toby Ziemke

Kelly Hamby – University of Maryland

Michael Crossley – University of Delaware
Galen Dively – University of Maryland
Jared Dyer – Cornell Cooperative Extension of Suffolk County
Anders Huseth – Michigan State University
Daniel Gilrein – Cornell Cooperative Extension of Suffolk County
Heather Grab – Penn State
Deborah Grantham – Cornell University/Northeastern IPM Center
Kristian Holmstrom – Rutgers University
Chris Jones – North Carolina State University
Thomas Kuhar – Virginia Tech
Joseph LaForest – University of Georgia
James MacDonald – University of Maryland
Ross Meentemeyer – North Carolina State University
Brian Nault – Cornell University
David Owens – University of Delaware
Colby Silvert – University of Maryland
Kemper Sutton – Virginia Tech
Veronica Yurchak – University of Maryland Extension

All the growers and extension specialists!

CEW IPM.org

Optimizing trap placement for improved *Helicoverpa zea* monitoring in sweet corn

John Mahas, Kelly Hamby, Christophe Duplais, Daniel Gilrein, Jared Dyer, David Owens, Thomas Kuhar, Brian Currin, Heather Grab, Grace Tiwari, Brian Nault
jwm366@cornell.edu

CEW IPM.org

Introduction

Corn earworm
(*Helicoverpa zea*)

Major pest in sweet corn

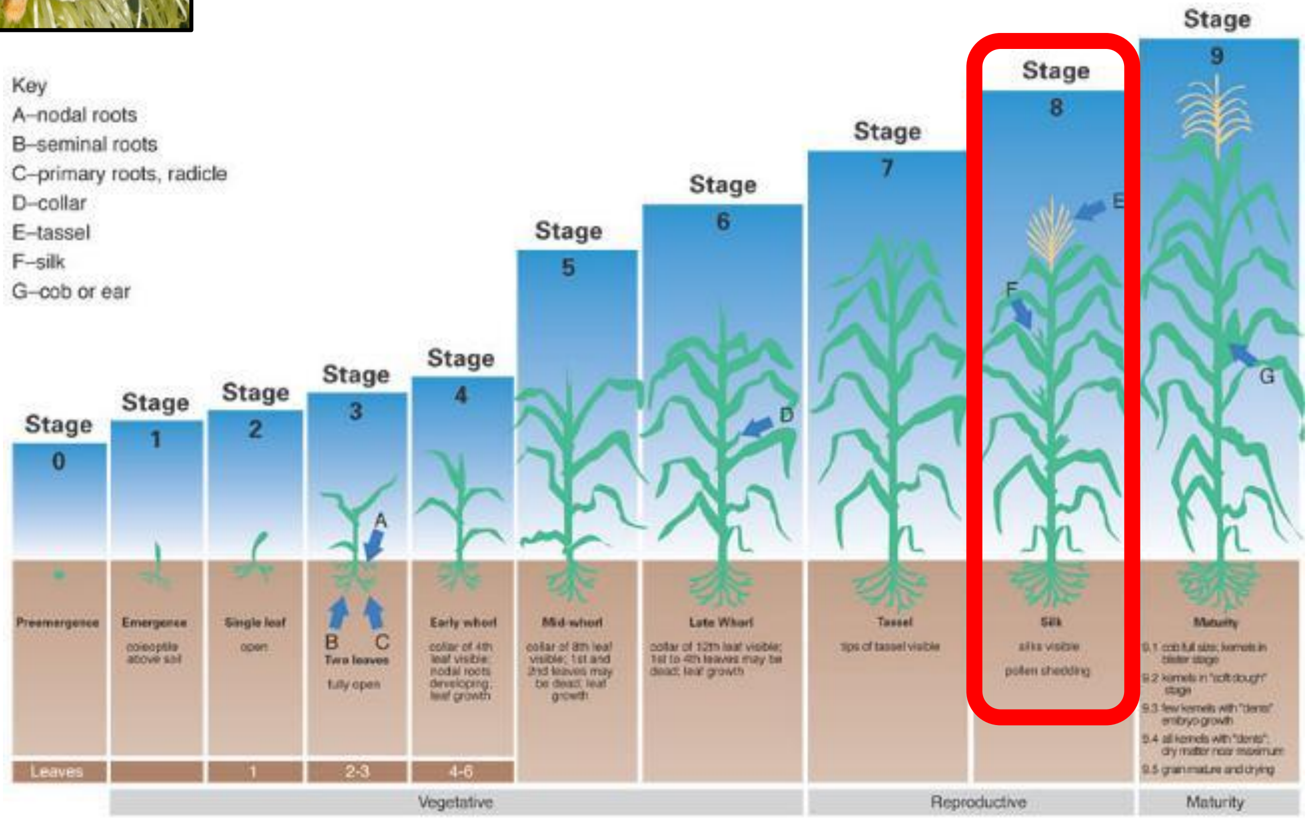
Migrates consistently south to north

Moths generally active from May through October

CEWIPM.org
Corn Earworm Integrated Pest Management

Introduction

Attracted to green silk where eggs laid

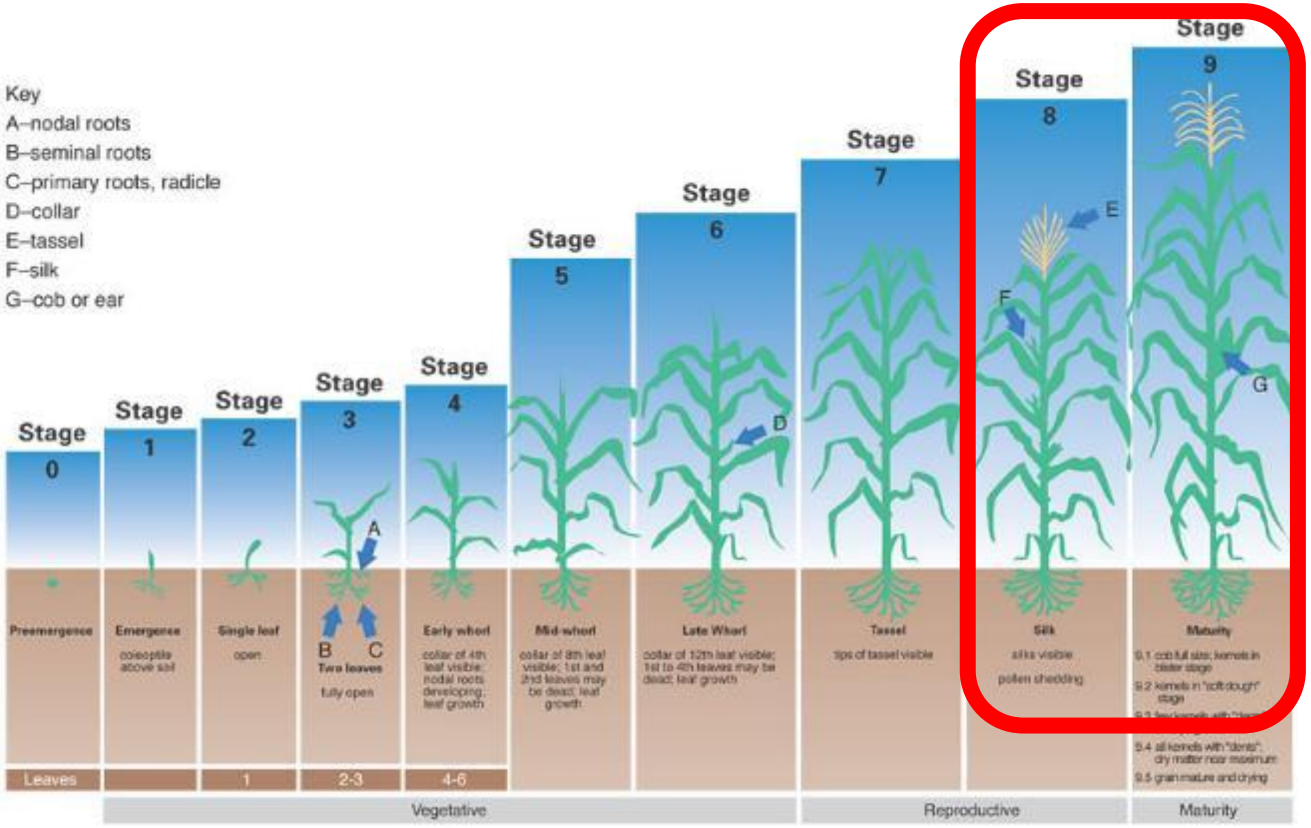


Source: *U.S. Department of Agriculture Technical Bulletin 976* and Hanway, J. J., 1966 *Special Report 48*, Iowa State University

CEWIPM.org
Corn Earworm Integrated Pest Management

Introduction

Damage occurs from dry silk to ear maturity



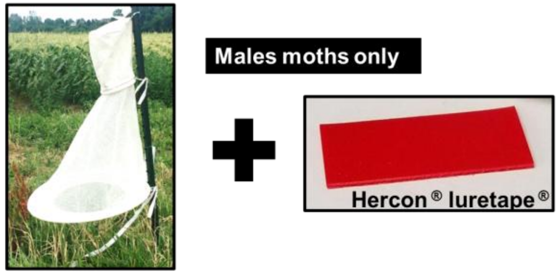
Source: U.S. Department of Agriculture Technical Bulletin 976 and Hanway, J. J., 1966 Special Report 48, Iowa State University

CEWIPM.org
Corn Earworm Integrated Pest Management

Introduction

- Insecticides often used to manage for pest
- Pheromone-baited traps used to measure pest abundance
- Moth catch used in action threshold

Pheromone-baited trap



Scentry® Heliothis trap

Action thresholds (number of CEW moths per trap) 		
Moths per night	**Moths per week**	**Spray Interval**
<0.2	<1.4	No spray
0.2-0.5	1.4-3.5	Every 6 days
0.5-1	3.5-7	Every 5 days
1-13	7-91	Every 4 days
>13	>91	Every 3 days

Insecticide application intervals based on Scentry® Heliothis trap with Hercon® luretape®

CEWIPM.org
Corn Earworm Integrated Pest Management

Introduction

- Placement of traps in the field may influence moth capture
  - May impact spray decisions and efficacy in monitoring *H. zea* populations

Pheromone-baited trap

Scentry® Heliothis trap

Males moths only

Action thresholds (number of CEW moths per trap)

Moths per night	Moths per week	Spray Interval
<0.2	<1.4	No spray
0.2-0.5	1.4-3.5	Every 6 days
0.5-1	3.5-7	Every 5 days
1-13	7-91	Every 4 days
>13	>91	Every 3 days

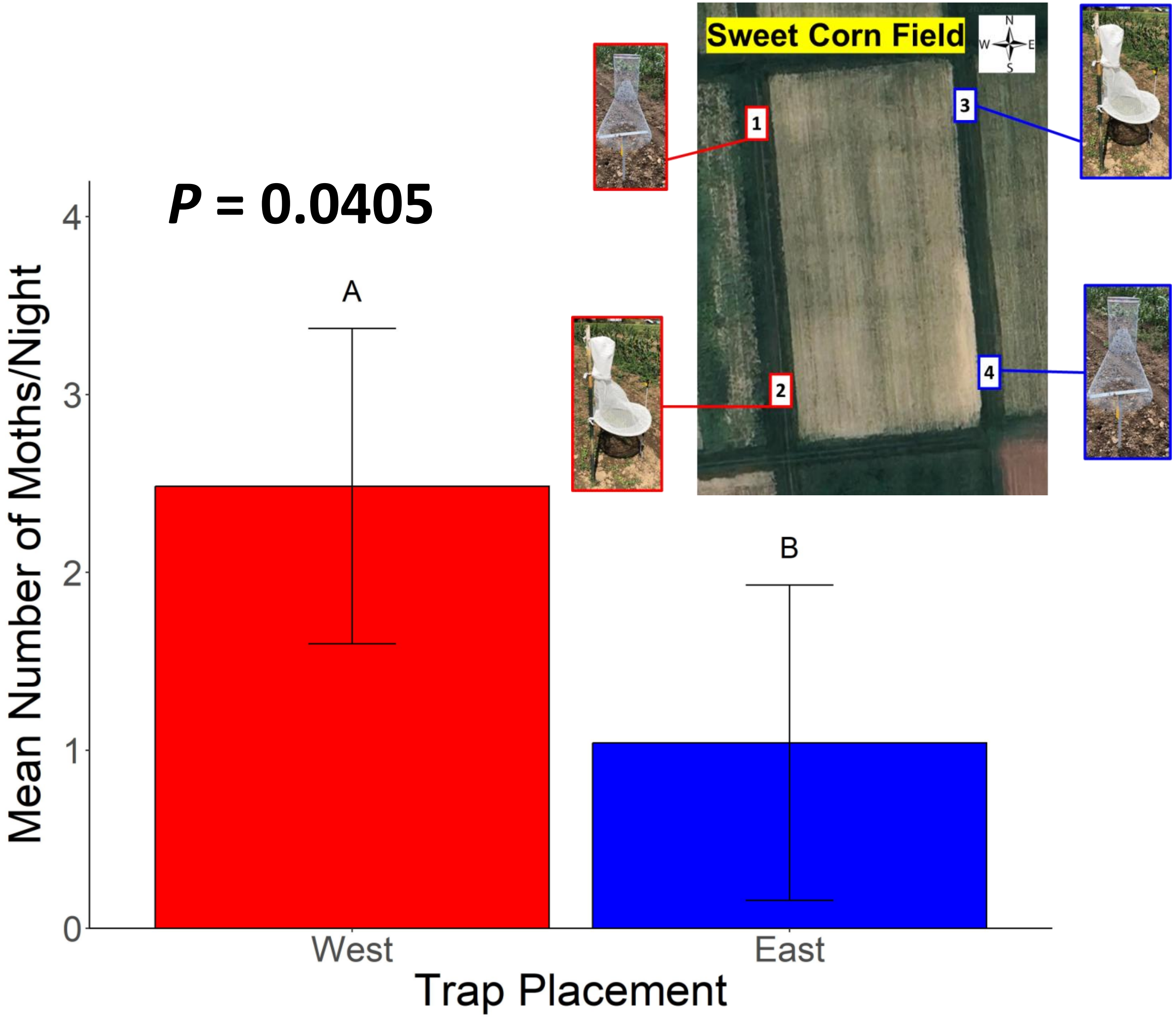
Insecticide application intervals based on Scentry® Heliothis trap with Hercon® luretape®

CEWIPM.org Corn Earworm Integrated Pest Management

Introduction

- Traps placed inside vs. outside of crop field

- Preliminary results showed more moths captured outside the west side of a sweet corn field



CEWIPM.org
Corn Earworm Integrated Pest Management

Introduction

Objective 1. Evaluate how placement of traps inside vs. outside of the crop field and cardinal direction of outside traps influence *H. zea* moth capture

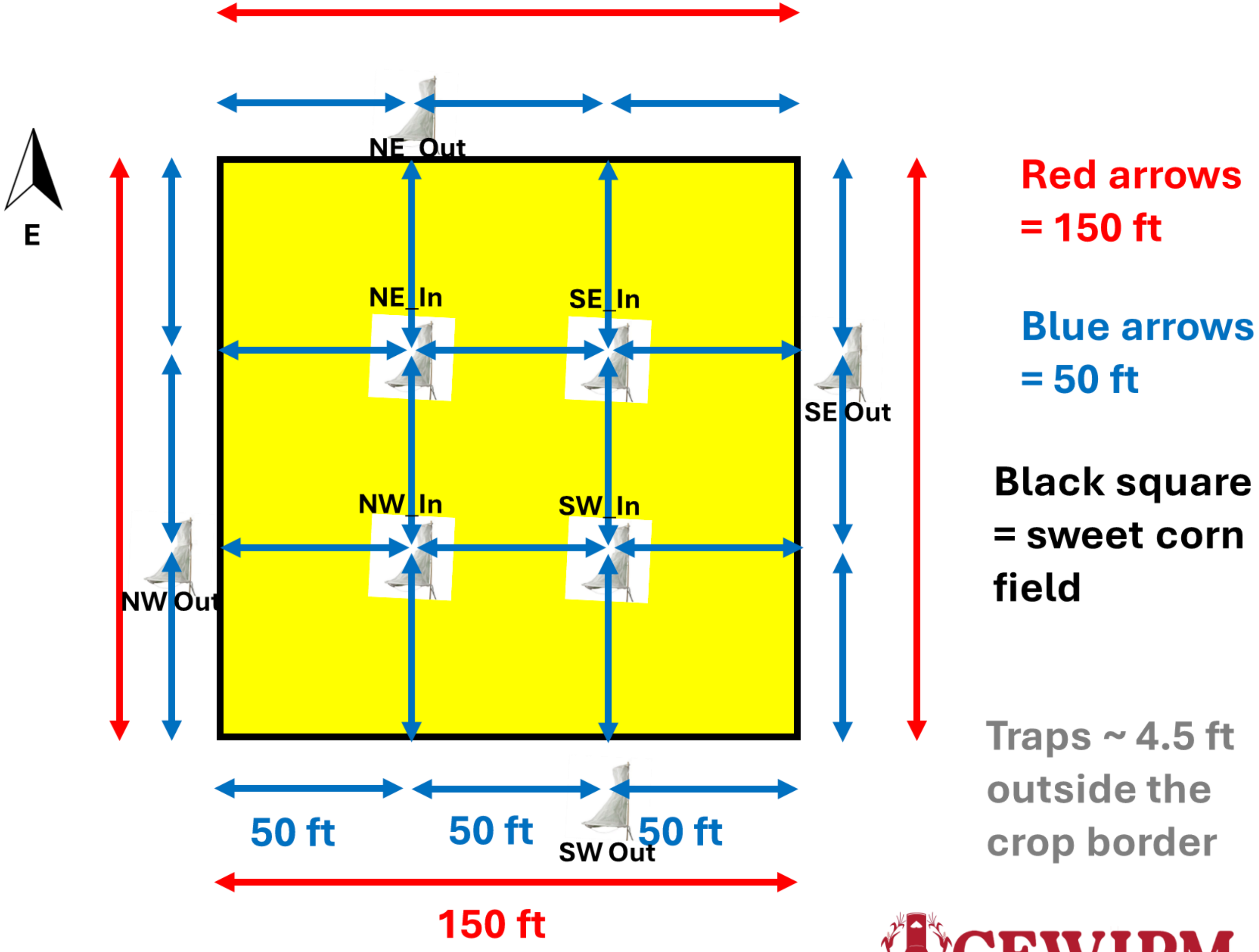
- **Hypothesis 1a.** More moths will be captured in traps placed outside the crop than traps inside the crop

- **Hypothesis 1b.** More moths will be caught in outside traps placed on the west side of the field than the other cardinal directions

Methods

Trapping dates and locations

- Sweet corn fields planted in Geneva, NY, Long Island, NY, MD, DE, PA, and VA (n = 6)
  - No host crops or landscape barriers within ~100 m of field
- 3-6 weeks during July-September, 2025



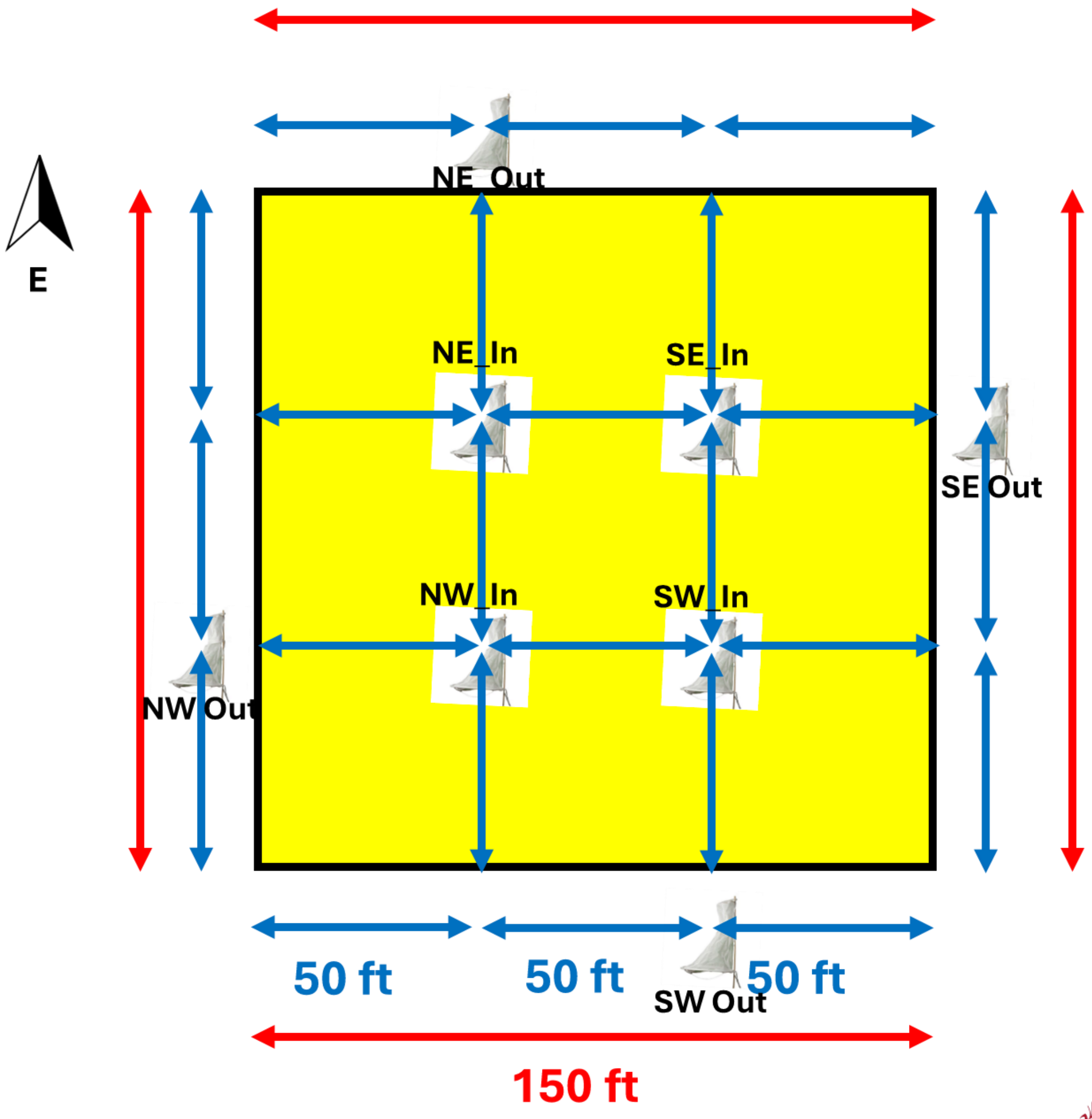
CEWIPM.org
Corn Earworm Integrated Pest Management

Methods

Trapping

- Heliothis traps baited with Hercon lures
  - Traps evenly distributed inside and outside of field
- Counted numbers of moths every 1-3 days

Analyses – GLMM



Red arrows = 150 ft

Blue arrows = 50 ft

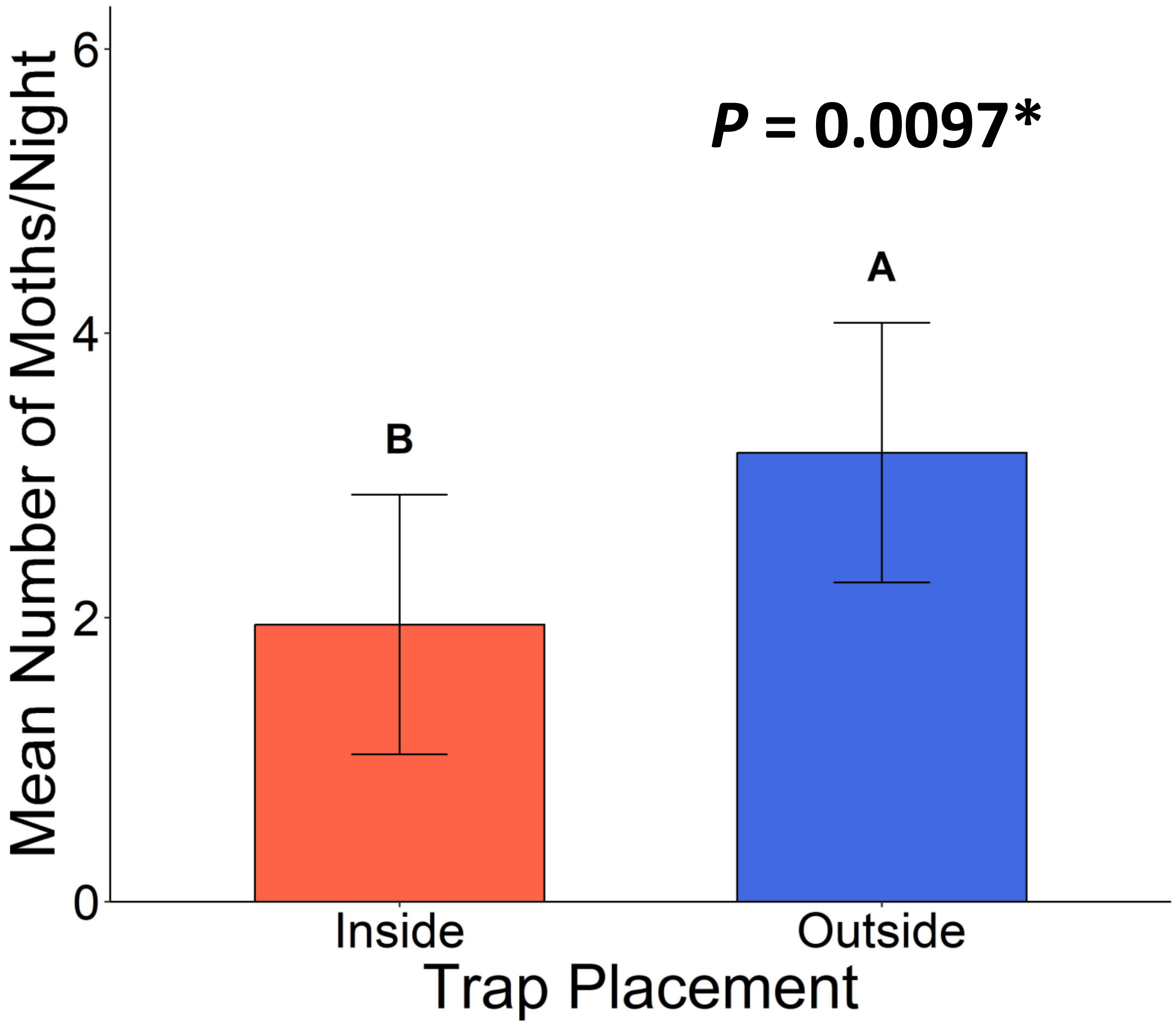
Black square = sweet corn field

Traps ~ 4.5 ft outside the crop border

*No significant spatial autocorrelation (*P* = > 0.05)

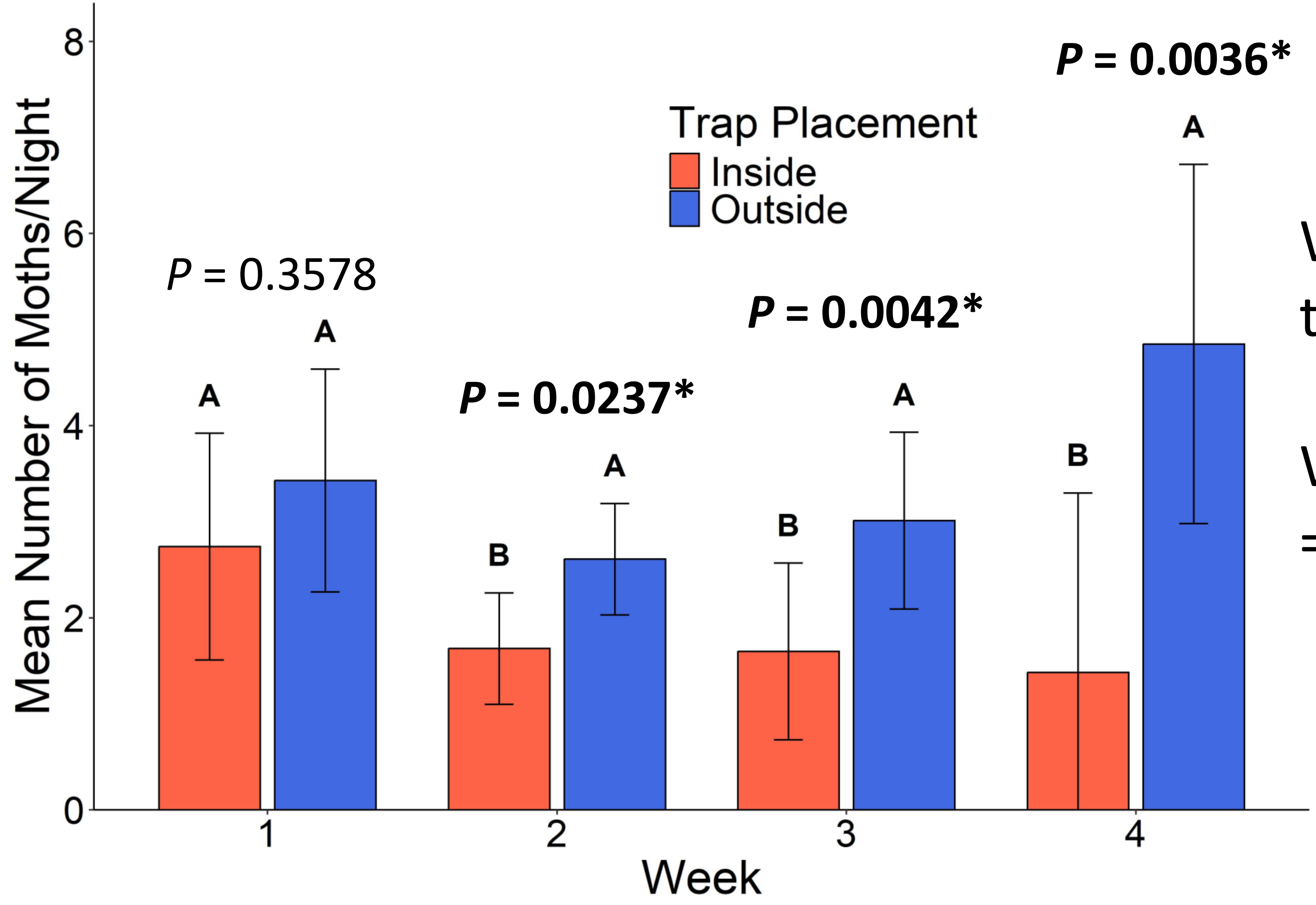
CEWIPM.org
Corn Earworm Integrated Pest Management

Results – Trap Placement (Inside vs. Outside)



CEWIPM.org
Corn Earworm Integrated Pest Management

Results – Trap Placement (Inside vs. Outside)



Week 1 = tasseling

Weeks 2 – 4 = silking

CEWIPM.org
Corn Earworm Integrated Pest Management

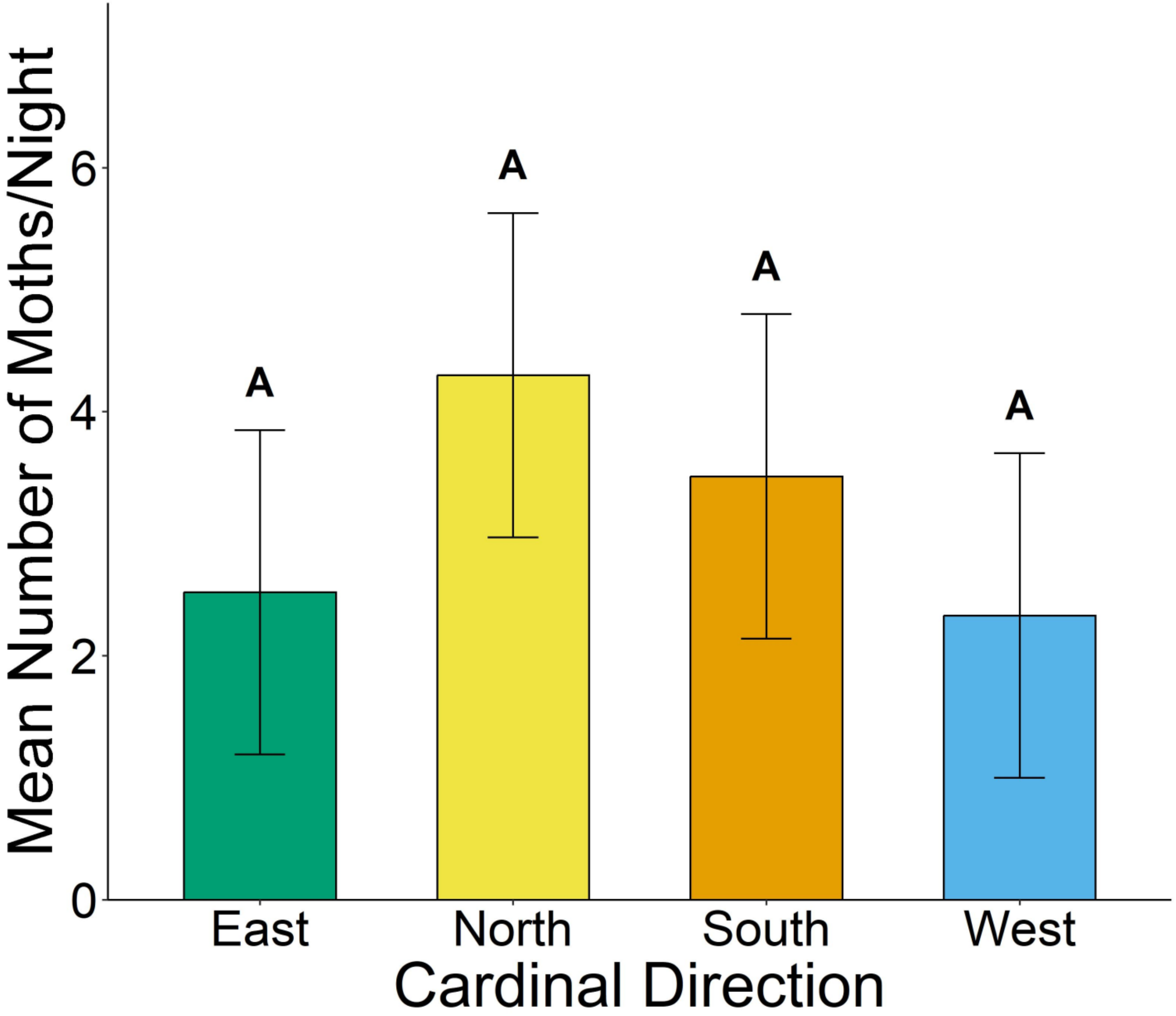
Results – Trap Placement (Inside vs. Outside)

Action thresholds (number of CEW moths per trap)		
Moths per night	**Moths per week**	**Spray Interval**
<0.2	<1.4	No spray
0.2-0.5	1.4-3.5	Every 6 days
0.5-1	3.5-7	Every 5 days
1-13	7-91	Every 4 days
>13	>91	Every 3 days

Insecticide application intervals based on Scentry® Heliothis trap with Hercon® luretape®

CEWIPM.org
Corn Earworm Integrated Pest Management

Results – Trap Placement (Cardinal Direction)



No significant differences by week ($P > 0.05$)

Discussion & Conclusion

- More moths were caught in traps placed outside the crop field than inside
  - This trend was significant for all weeks of silking, but not tasseling
  - Place traps outside the field
- Placement of outside traps on any cardinal direction of the field did not influence moth capture

Geneva, NY Field Overview

CEWIPM.org
Corn Earworm Integrated Pest Management

Thank you!

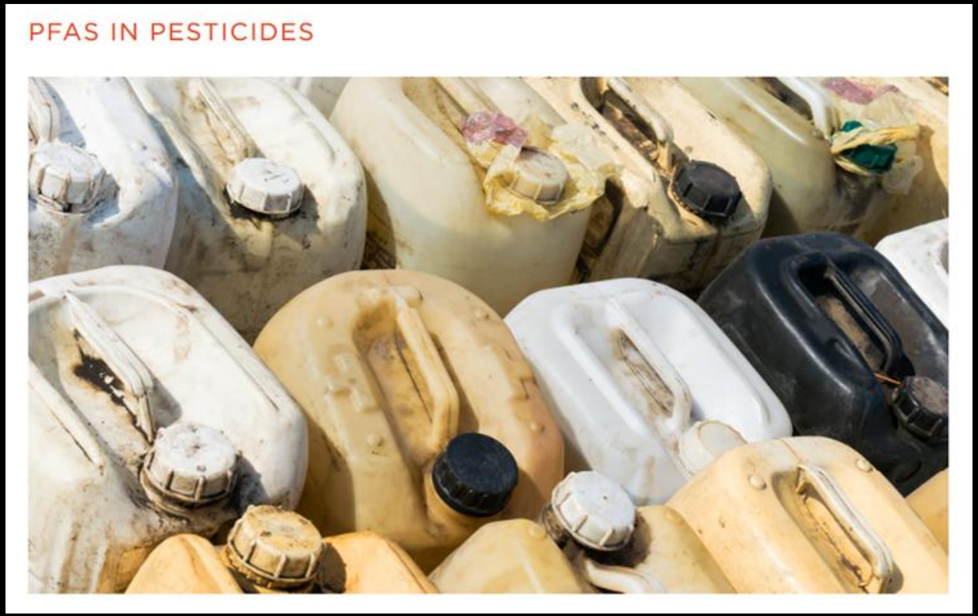
LinkedIn

John Mahas
Postdoctoral Research Associate,
Cornell University

Email:
jwm366@cornell.edu

CEWIPM.org
Corn Earworm Integrated Pest Management

Policy issues to be aware of



Tom Kuhar[1], Dan Gilrein[2], Kelly Hamby[3]
[1]Professor, Virginia Tech
[2]Extension Specialist, Cornell University, Long Island, NY
[3]Associate Professor, University of Maryland

CEWIPM.org

What the h--- is PULA?

PULA (Pesticide use limitation area)

- If limitations on pesticide use are necessary to protect listed species or their habitats, they will be referenced on the pesticide label.
- Any limitations in an area are considered Pesticide Use Limitation Area (PULA).

CEWIPM.org
Corn Earworm Integrated Pest Management

What the h--- is PULA?

Pula, a seafront city on the tip of Croatia’s Istrian Peninsula, is known for its protected harbor, beach-lined coast and Roman ruins. Settled in the prehistoric era and valued for its strategic location, Pula has been occupied, destroyed and rebuilt numerous times. The Romans, Ostrogoths and Venetians, as well as the Allied Forces in World War II, have each administered the city.

CEWIPM.org
Corn Earworm Integrated Pest Management

Pesticides and Endangered Species Educational Resources Toolbox

The Pesticide and Endangered Species Educational Resources Toolbox catalogs educational resources including guidance documents, handouts, presentations, informational webinars, and other resources relating to EPA's endangered species work. EPA developed the materials in this toolbox for a variety of stakeholders who may have differing levels of knowledge about EPA's efforts to protect listed species. For example, crop consultants, retailers, extension agents, and others, may use these materials to educate growers and applicators on the Endangered Species Act strategies or mitigation measures they may see on product labels.

EPA will continue adding new materials to the toolbox as they are developed.

The toolbox can be sorted alphabetically, by publication date, or topic, etc. and has a search function. Select the arrow in each column heading to sort the toolbox by ascending or descending order.

https://www.epa.gov/endangered-species/pesticides-and-endangered-species-educational-resources-toolbox

Pesticide Use Limitation Areas (PULA)

PULA's are contained within Endangered Species Protection Program (ESPP) Bulletins

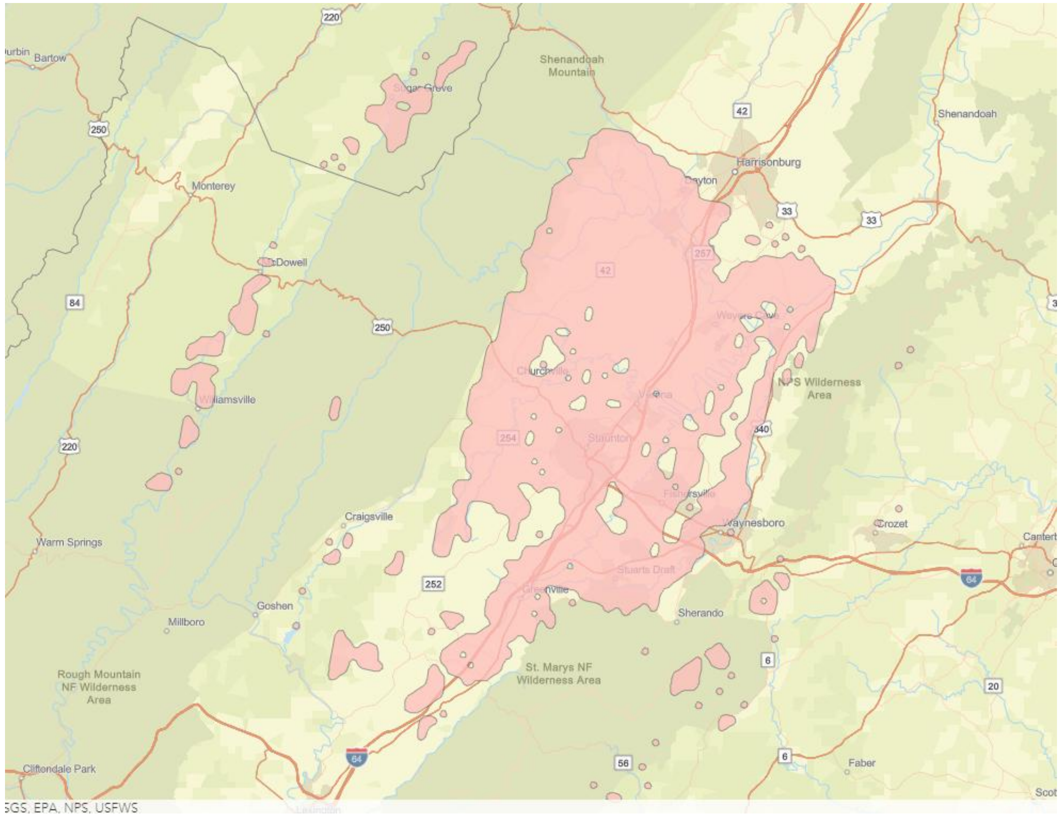
A bulletin consists of:

- Spatial location of pesticide use limitations
- Product/application/formulation information
- Limitation/mitigation language

Bulletins are an extension of the label and are enforceable.

Allows for location-specific protections.

Bulletins can be converted into a 'printable' pdf.



Accessing ESPP Bulletins

If you are not able to access Bulletins Live! Two using your cell phone browser, or if you have other questions, you can contact EPA for assistance at:

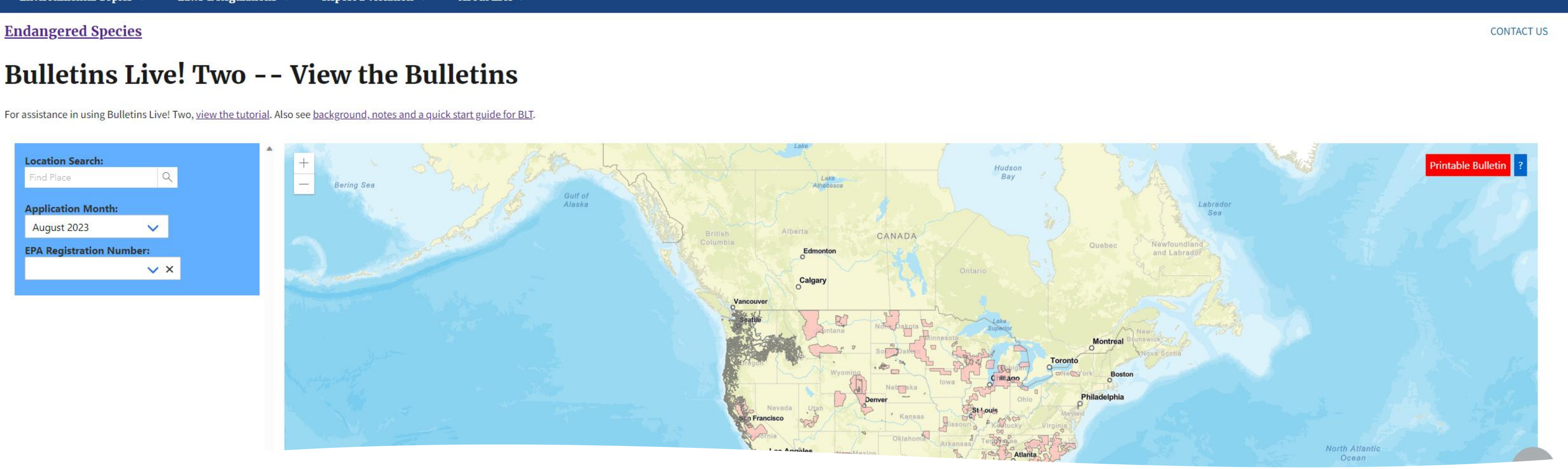
1) EPA Help Desk Inbox espp@epa.gov; or
2) EPA Hotline at 1-844-447-3813.

If pesticide label directs user to the *Bulletins Live! Two* website they are required to follow the pesticide use limitations (if any) found in the Bulletin for your county, pesticide active ingredient and application month.

Pesticide users who fail to follow label provisions for their pesticide application, whether that failure results in harm to a listed species or not, will be subject to enforcement under the misuse provisions of FIFRA.

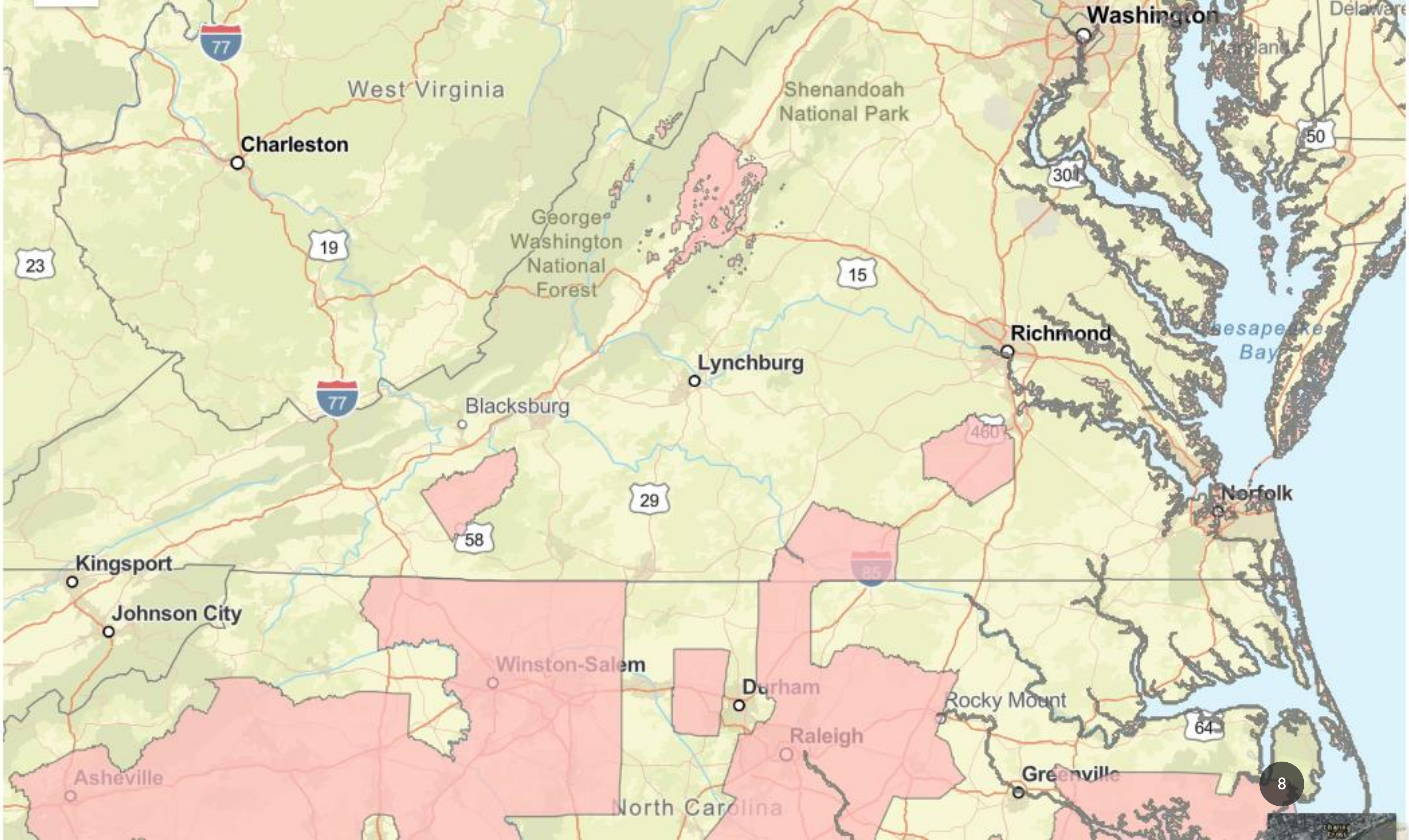
Bulletins are available using EPA's *Bulletins Live! Two* system through the website **https://www.epa.gov/endangered-species/bulletins-live-two-view-bulletins/**

**Available on your cell phone web browser however, it does not currently exist as an app.*



Finding Mitigation Requirements

- Bulletins Live! Two allows pesticide users to search by:
  - Location (field, address, crossroads, zip code, GPS coordinates, or other location area)
  - Application Month
  - EPA Registration Number
- Works on a computer.



West Virginia
Charleston
77
19
23
George Washington National Forest
Shenandoah National Park
Washington
Maryland
Delaware
50
301
15
Richmond
Bay
Lynchburg
Blacksburg
460
Norfolk
29
58
85
Kingsport
Johnson City
Winston-Salem
Durham
Raleigh
Rocky Mount
64
Greenville
Asheville
North Carolina

Bulletins Live! Two -- View the Bulletins

For assistance in using Bulletins Live! Two, view the tutorial. Also see background, notes and a quick start guide for BLT.

Directions

This tool displays Pesticide Use Limitation Areas (PULAs) for products with active Endangered Species Protection Bulletins. To generate a printable bulletin, please follow these steps:

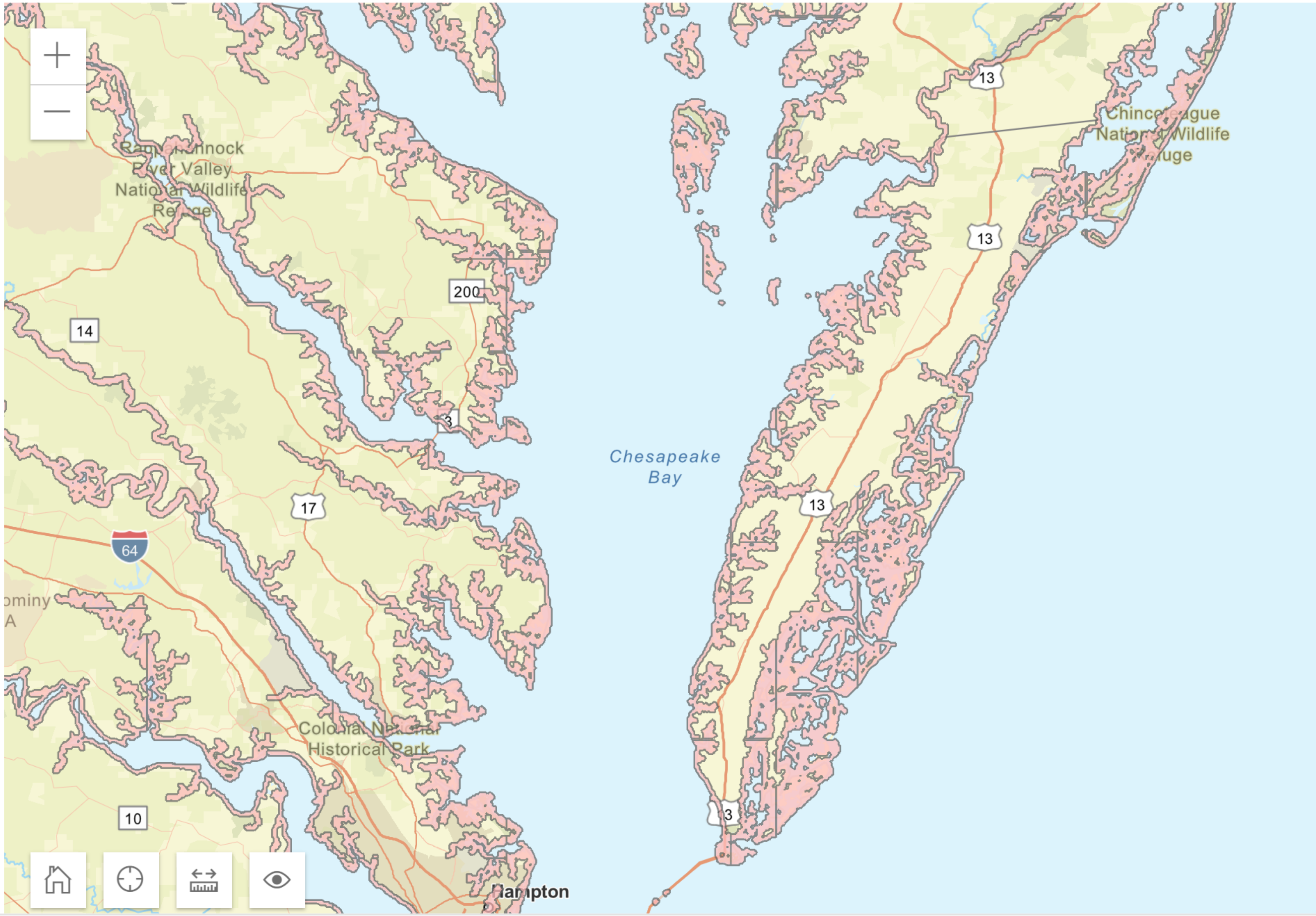
1. Navigate to your intended pesticide application area by using the "Location Search" tool or panning and zooming on the map itself.
2. Select your Application Month from the Application Date dropdown.
3. Search specific pesticide product(s) by entering the EPA product registration

Unpin

Location Search:

Find Place

Application Month:



Example Label Language

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Endangered Species Protection Requirements:
It is a Federal offense to use any pesticide in a manner that results in an unauthorized "take" (e.g., kill or otherwise harm) of an endangered species and certain threatened species, under the Endangered Species Act section 9. When using this product, you must follow the measures contained in the Endangered Species Protection Bulletin for the area in which you are applying the product. You must obtain a Bulletin no earlier than six months before using this product. To obtain Bulletins, consult http://www.epa.gov/espp/, call 1-844-447-3813, or email ESPP@epa.gov. You must use the Bulletin valid for the month in which you will apply the product.

Use this product only in accordance with directions on this label or in separately published EPA accepted supplemental labeling directions for this product.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

From Exirel label

ENDANGERED AND THREATENED SPECIES PROTECTION REQUIREMENTS: Before using this product, you must obtain any applicable Endangered Species Protection Bulletins ('Bulletins') within six months prior to or on the day of application. To obtain Bulletins, go to Bulletins Live! Two (BLT) at https://www.epa.gov/pesticides/bulletins. When using this product, you must follow all directions and restrictions contained in any applicable Bulletin(s) for the area where you are applying the product, including any restrictions on application timing if applicable. It is a violation of Federal law to use this product in a manner inconsistent with its labeling, including this labeling instruction to follow all directions and restrictions contained in any applicable Bulletin(s). For general questions or technical help, call 1-844-447-3813, or email ESPP@epa.gov.

From Mainspring GNL label

ENDANGERED AND THREATENED SPECIES PROTECTION REQUIREMENTS

Before using this product, you must obtain any applicable Endangered Species Protection Bulletins ('Bulletins') within six months prior to or on the day of application. To obtain Bulletins, go to Bulletins Live! Two (BLT) at https://www.epa.gov/pesticides/bulletins. When using this product, you must follow all directions and restrictions contained in any applicable Bulletin(s) for the area where you are applying the product, including any restrictions on application timing if applicable. It is a violation of federal law to use this product in a manner inconsistent with its labeling, including this labeling instruction to follow all directions and restrictions contained in any applicable Bulletin(s). For general questions or technical help, call 1-844-447-3813, or email ESPP@epa.gov.

EPA Announces Action to Protect Endangered Species from Insecticide Methomyl

Released August 12, 2025

Today, the U.S. Environmental Protection Agency (EPA) is announcing that it has approved labels that implement measures required by the National Marine Fisheries Service (NMFS) final biological opinion on methomyl. In addition to the measures required by NMFS, EPA approved an action initiated by a methomyl registrant to reclassify the last remaining non-restricted use pesticide (RUP) methomyl product as a RUP. All methomyl products are RUPs and may only be applied by certified applicators. Methomyl is an insecticide used on a variety of crops, including field vegetables and orchard crops.

EPA's March 2021 biological evaluation for methomyl determined that use of the pesticide according to label instructions was "likely to adversely affect" at least one animal or plant for 1,098 listed species and 281 designated critical habitats. EPA initiated formal consultation with NMFS and, in response, NMFS developed a biological opinion for methomyl, which only covers species under NMFS's purview. Of the species and habitats under NMFS jurisdiction, NMFS concluded that the use of methomyl is "likely to adversely affect" 61 species and 56 critical habitats.

The NMFS biological opinion was issued in February 2024 after completing consultation with EPA on the registration review of methomyl and the effects of the insecticide on federally threatened or endangered (listed) species and their designated critical habitats. NMFS determined that, with the inclusion of mitigation measures, the registered uses of methomyl will not result in jeopardy determinations for species under NMFS jurisdiction.

Other changes with Lannate

Lannate® LV
Insecticide

- Corteva AgriScience will no longer sell/support Lannate.
- NovaSource is now the registrant for existing Lannate labels.

RESTRICTED USE PESTICIDE
Due to High Acute Toxicity to Humans

For retail sale and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification. Direct supervision for this product requires the certified applicator to review federal and supplemental label instructions with all personnel prior to application, mixing, loading, or repair or cleaning of application equipment.

GROUP	1A	INSECTICIDE

Lannate® LV
INSECTICIDE

NovaSource
Tessenderlo Group

Water Soluble Liquid

Contains 2.4 lbs active ingredient per gallon.

Active Ingredient	***By Weight***
Methomyl (S-methyl-N-[(methylcarbamoyl)oxy]thioacetimidate)	29%
Other Ingredients	71%
TOTAL	100%

EPA Reg. 61842-55 EPA Est. No. ___________

KEEP OUT OF REACH OF CHILDREN

DANGER
PELIGRO

POISON

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand this label, find someone to explain it to you in detail.)

FIRST AID

This Product is an N-Methyl Carbamate insecticide.

IF SWALLOWED: Call a poison control center or doctor immediately for treatment advice. Drink 1 or 2 glasses of water and induce vomiting by touching back of throat with finger. Do not induce vomiting or give anything by mouth to an unconscious person.

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor

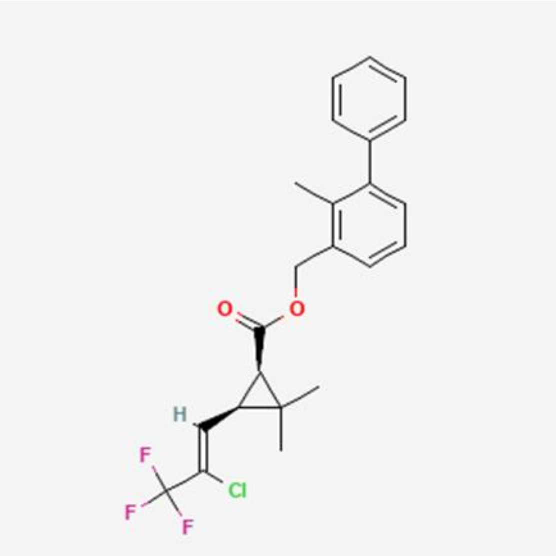
CEWIPM.org
Corn Earworm Integrated Pest Management

What the h--- is PFAS?

Per- and Polyfluoroalkyl Substances

- Often called "forever chemicals"
- Due to their extreme persistence in the environment and potential health risks, the presence of PFAS is emerging as a significant source of contamination for soil, water, and food.

- Widespread Usage in Pesticides: In the United States, roughly 14% of all registered conventional pesticide active ingredients are classified as PFAS. This has increased to nearly 30% for new active ingredients approved in the last decade.



Sources of PFAS in pesticides:

- Active Ingredients: Chemicals designed to kill pests are increasingly fluorinated.
- Inert Ingredients: "Inert" or inactive ingredients added to enhance performance (e.g., as spreaders or stickers) can contain PFAS, though these are not required to be disclosed on labels.
- Container Leaching: Pesticides stored in fluorinated high-density polyethylene (HDPE) containers can leach PFAS from the container walls into the product.

CEWIPM.org
Corn Earworm Integrated Pest Management

PFAS Regulatory Status & Actions

- **EPA Action:** The EPA has not banned any PFAS pesticides under the main pesticide statute (FIFRA). However, in 2022, they took action to stop the use of 12 specific PFAS in pesticide products. The EPA has noted that it finds no human health risks when approved pesticides are used according to label instructions, a position challenged by some environmental groups.

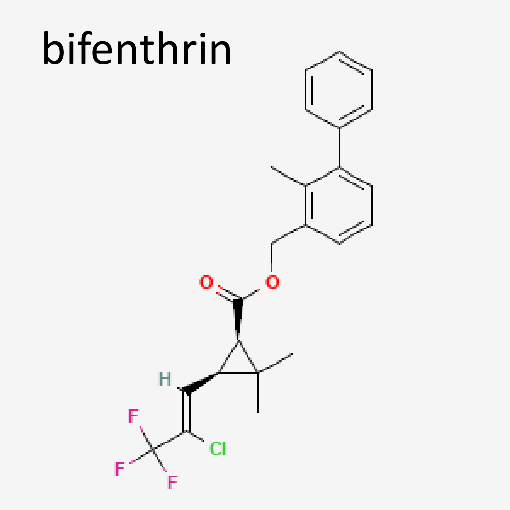
- **State-Level Actions:** Product Bans: States like Maine, Minnesota, and Washington are banning PFAS in specific consumer products, with some bans taking effect in 2026 and 2027.

- **International Action:** The European Union has banned or declined to renew approval for several PFAS-containing pesticides, such as flufenacet, bifenthrin, and trifluralin.

Some PFAS containing Insecticides

Considered PFAS Pesticides

- Bifenthrin
- Lambda-cyhalothrin
- Isocycloseram (Plinazolin)
- Avaunt (indoxacarb)

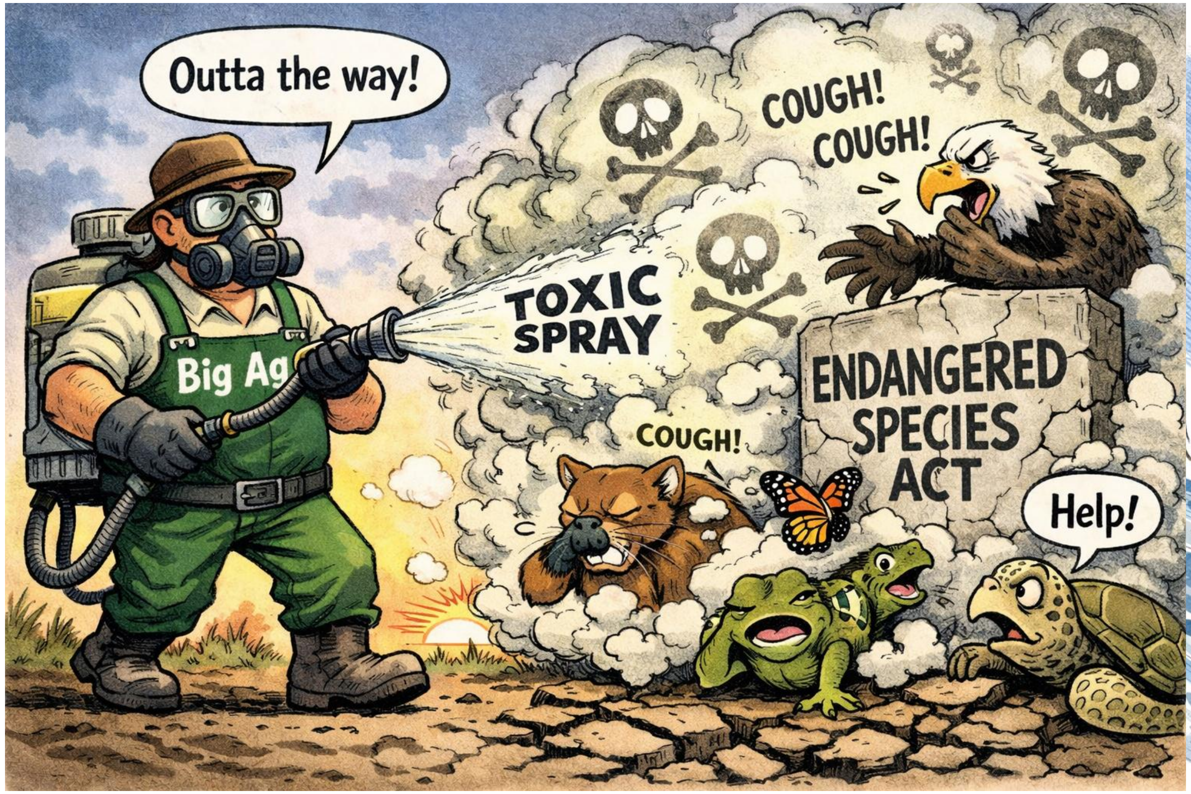


Not considered PFAS pesticides

- Lannate LV (methomyl)
- Coragen (chlorantraniliprole)
- Radiant SC (spinetoram)
- Blackhawk (Spinosad)
- Permethrin
- Mustang Maxx (zeta-cypermethrin)
- Asana® XL (esfenvalerate)
- Baythroid XL (beta-cyfluthrin)
- Assail (acetamiprid)

CEWIPM.org
Corn Earworm Integrated Pest Management

Questions? Comments?



CEWIPM.org
Corn Earworm Integrated Pest Management

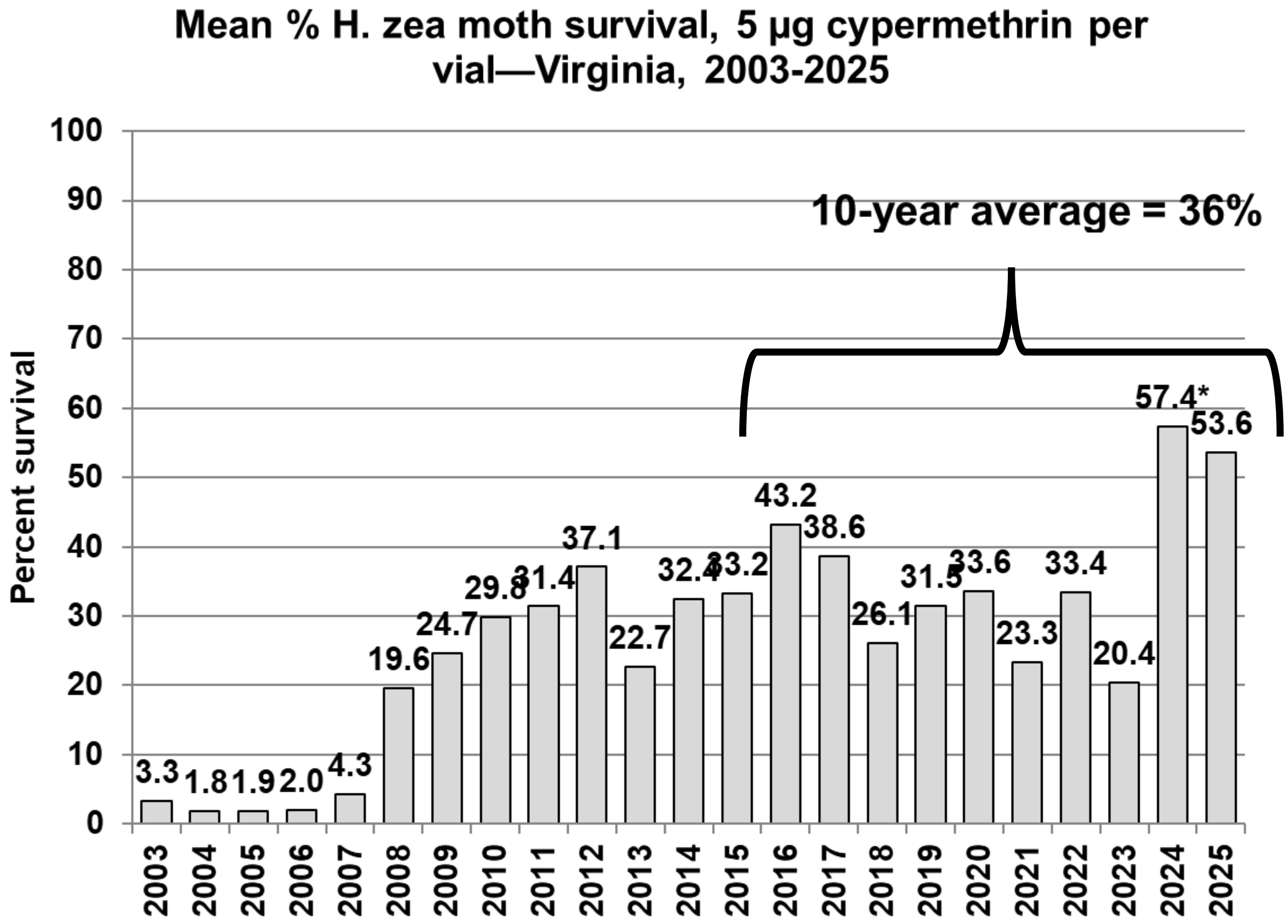
Addressing evolving CEW management challenges in sweet corn grown in the Eastern US

Monitoring Pyrethroid Resistance

David Owens, Kelly Hamby
Tom Kuhar, Brian Currin, Kemper Sutton, Brian Nault
owensd@udel.edu

CEWIPM.org

History: CEW Pyrethroid Resistance

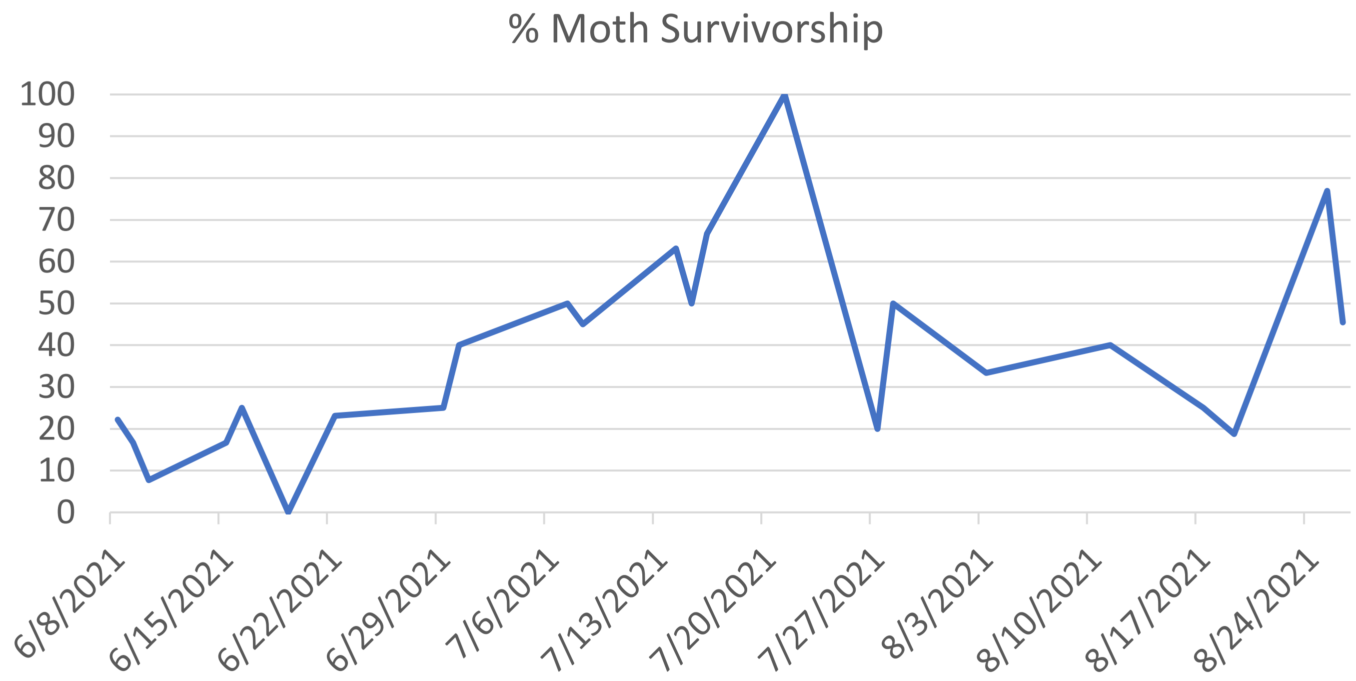


Data from Sean Malone, Va Tech

- Pyrethroid resistance and field efficacy decline observed in mid-Atlantic since 2000's
- Standard Adult Vial Monitoring Test developed in 1980-1990s
- Adults collected from pheromone traps. 24hr later if can fly 3+ feet = alive and resistant

CEWIPM.org
Corn Earworm Integrated Pest Management

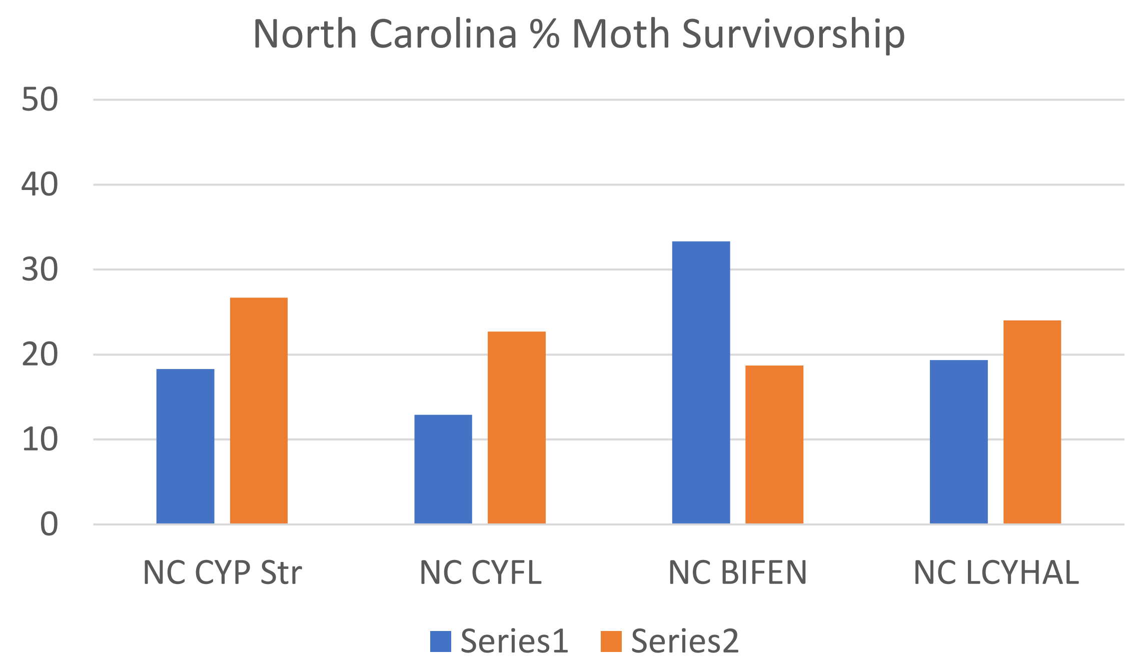
History: Resistance Pattern During Seasons



- Looking at in-season trends reveals a few interesting patterns
- 2021: resistance started low, built in July, plateaued at ~40% August

CEWIPM.org
Corn Earworm Integrated Pest Management

History: Vial Testing NC 2024

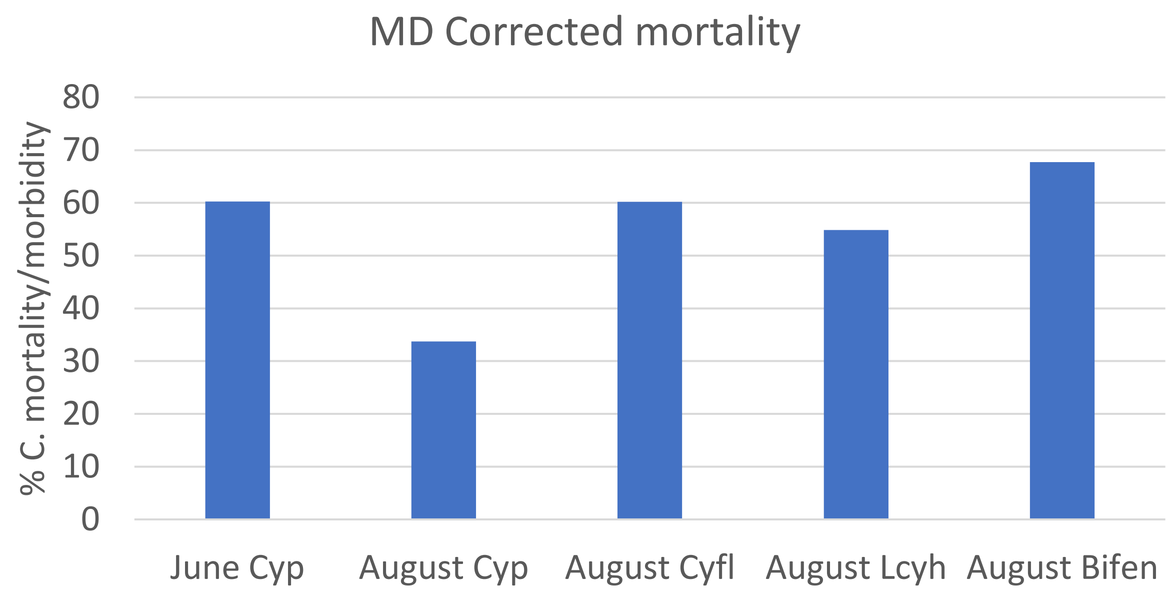


- Blue bars: June, Orange bars: August
- Small differences, Small increase in ‘resistance’
- Biggest change with bifenthrin?

CEWIPM.org Corn Earworm Integrated Pest Management

Adult Vial Tests 2025

Maryland

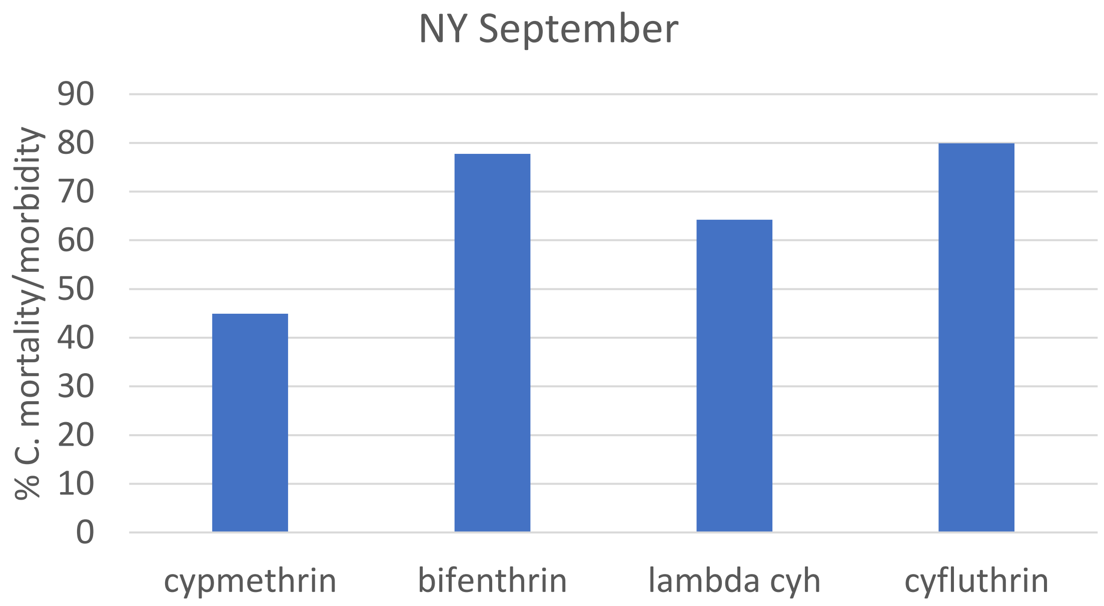


- June mortality relatively low compared to previous years
- August mortality even lower
- Bifenthrin>Cyfluthrin>/= lambda cyhalothrin>cypermethrin

CEWIPM.org
Corn Earworm Integrated Pest Management

Adult Vial Tests

New York

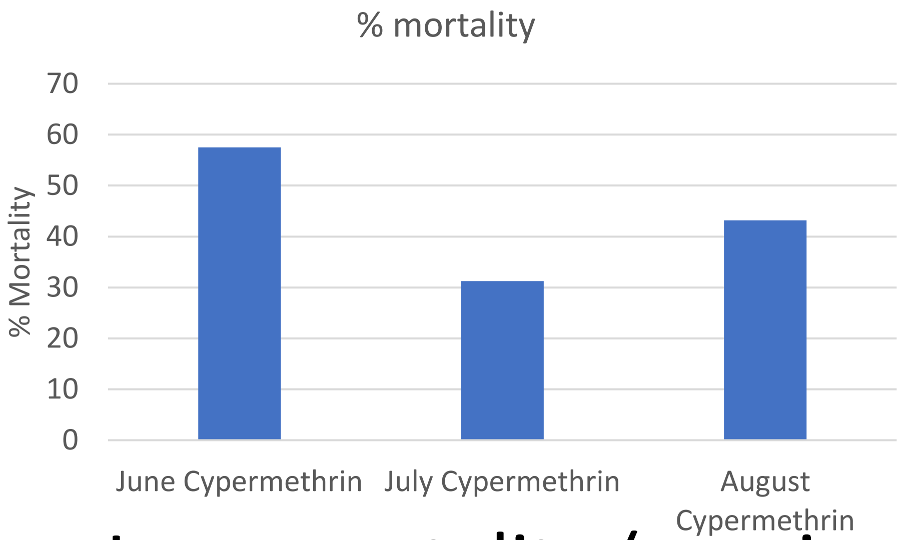


- Low cypermethrin mortality (historically should be 60-70%
- Cyfluthrin =/>bifenthrin>lambda-cyhalothrin>cypermethrin

CEWIPM.org
Corn Earworm Integrated Pest Management

Adult Vial Tests

Delaware Cypermethrin

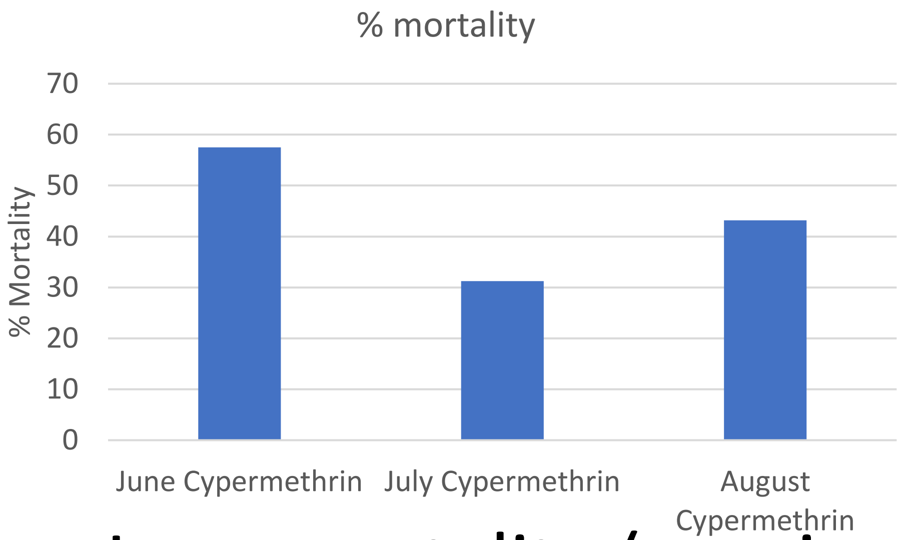


- Unusually low June mortality (previous years ~ 70-85%)
- Unusually low July mortality (previous years ~ 50-60%)

CEWIPM.org
Corn Earworm Integrated Pest Management

Adult Vial Tests

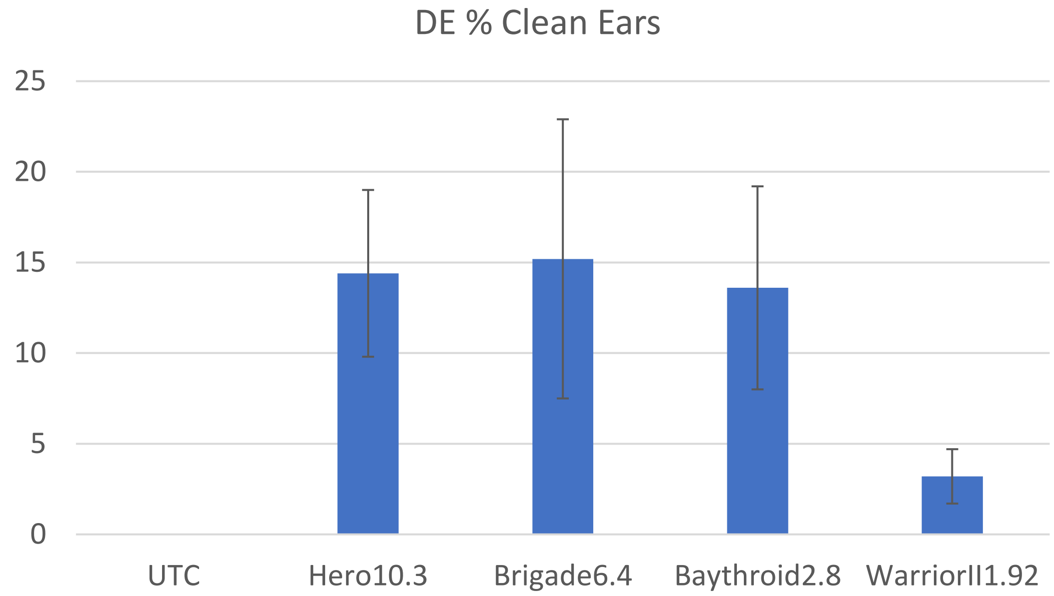
Delaware Cypermethrin



- Unusually low June mortality (previous years ~ 70-85%)
- Unusually low July mortality (previous years ~ 50-60%)

How Do AVT Compare w/ Field?

Delaware Spray Trial 2025

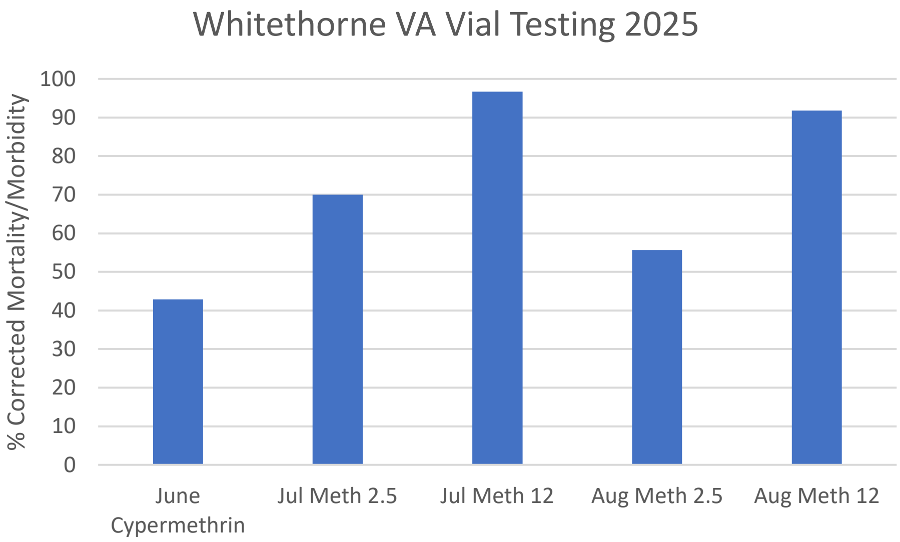


- 7 applications. First applications with wet weather, including at time of application.
- CEW traps ~ 14/night at beginning of silking, Temps cooled.
- DE: Worst pyrethroid efficacy BY FAR in 8 years of Owens backpack trials

CEWIPM.org Corn Earworm Integrated Pest Management

Adult Vial Tests

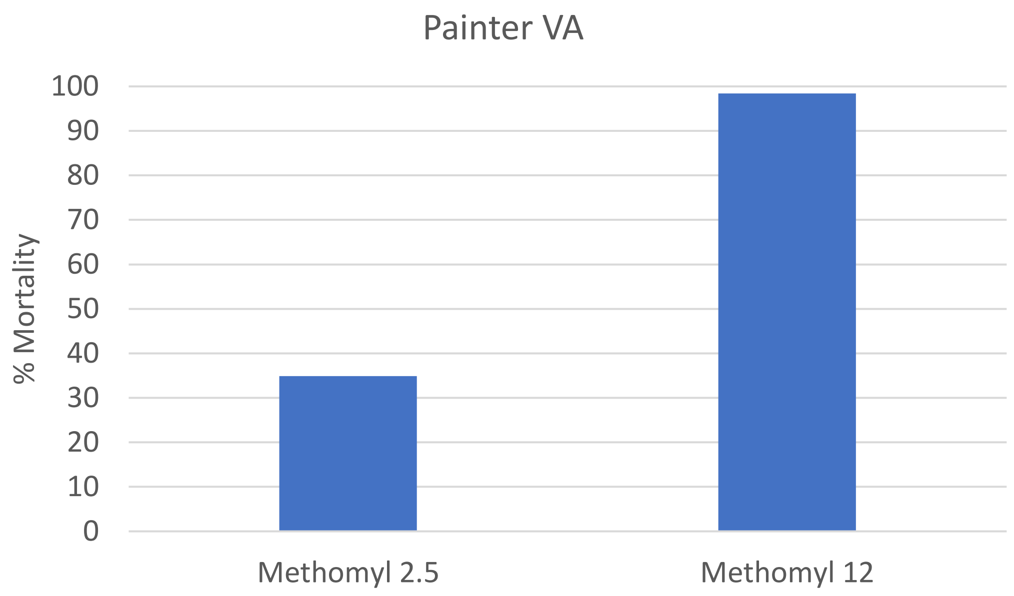
Western Virginia



- June % mortality also quite low
- Tested Methomyl. Herbert et al 2008: ~ 50% and 90% mortality

Adult Vial Tests

Virginia

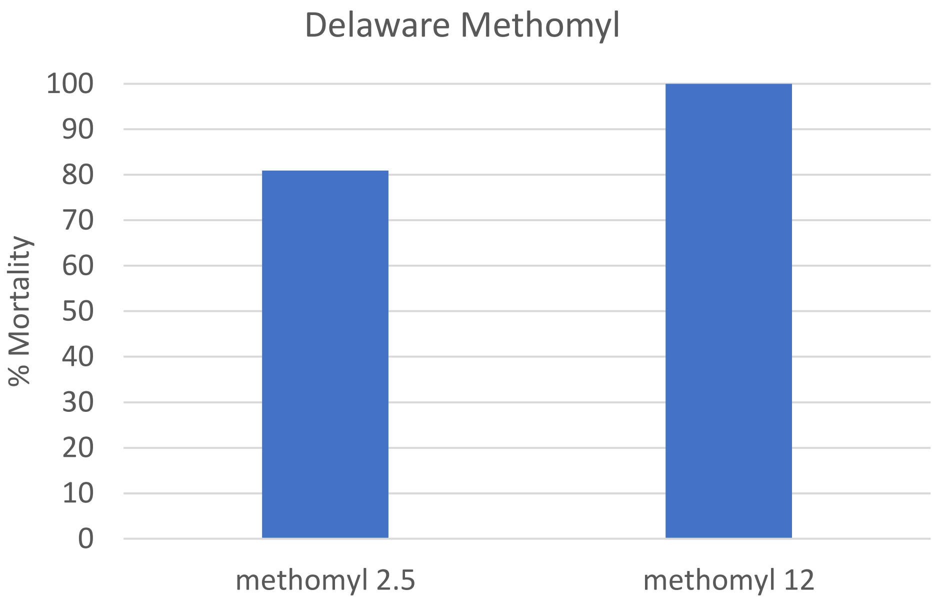


- Tested Methomyl resistance in July
- Herbert et al 2008: ~ 50% and 90% mortality

CEWIPM.org
Corn Earworm Integrated Pest Management

Adult Vial Tests

Delaware Methomyl



- Herbert et al. 2008 ~ 50% - 90% mortality

CEWIPM.org
Corn Earworm Integrated Pest Management

Adult Vial Tests

Bottom Line

- Pyrethroid mortality VERY LOW in 2025
- Moths still susceptible to Methomyl
- Bifenthrin and Cyfluthrin > lambda cyhalothrin
- Patterns consistent among sites

Insecticide Efficacy and Diamide Resistance Monitoring Update

Dr. Kemper Sutton, Assistant Professor and Extension Specialist, Virginia Tech
Eastern Shore AREC, Painter, VA
klsutton@vt.edu

CEWIPM.org

The Bean Dip Bioassay: Serving Up Fast Answers for Farmers

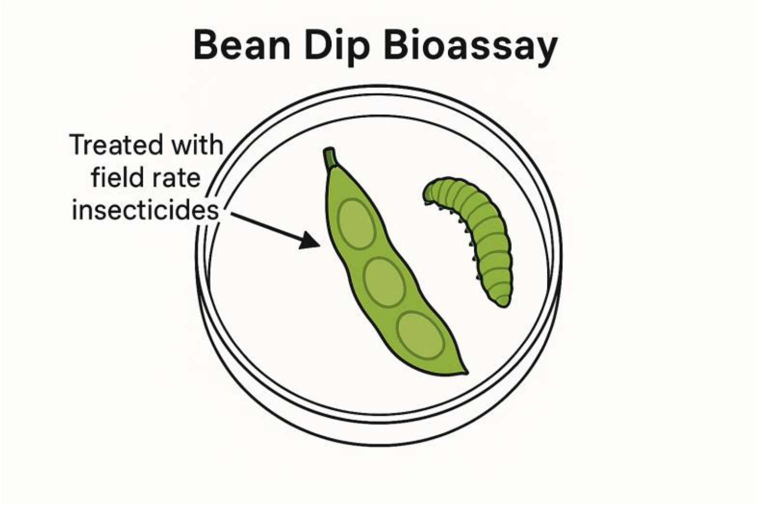
2-3rd instars collected from grower/station fields and placed into cups

An organic green bean or edamame pod is dipped into a field rate solution of insecticide.

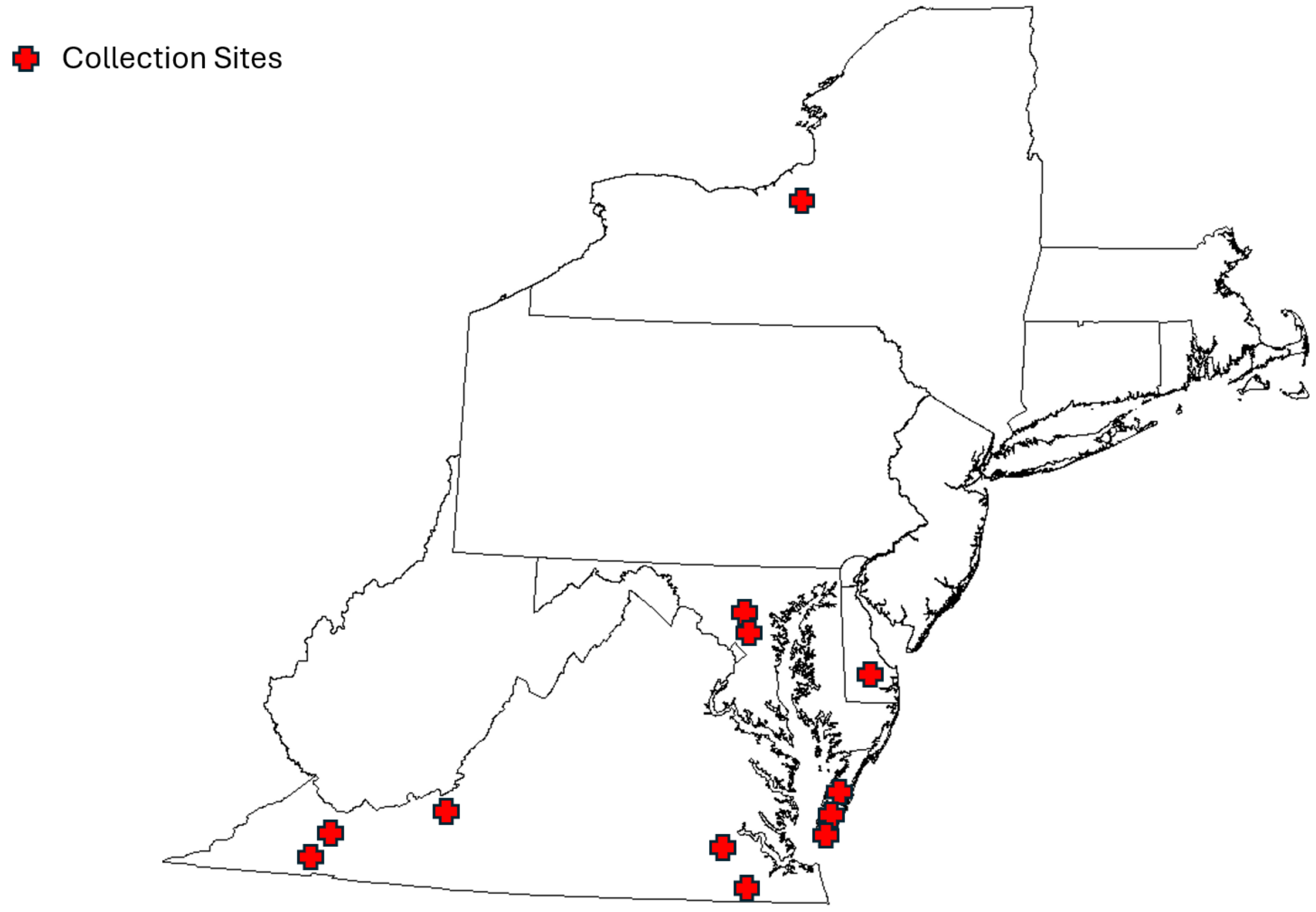
Vantacor (chlorantraniliprole) @ 1x rate (2.5 fl oz/acre)

Mortality recorded every 24h for 96h

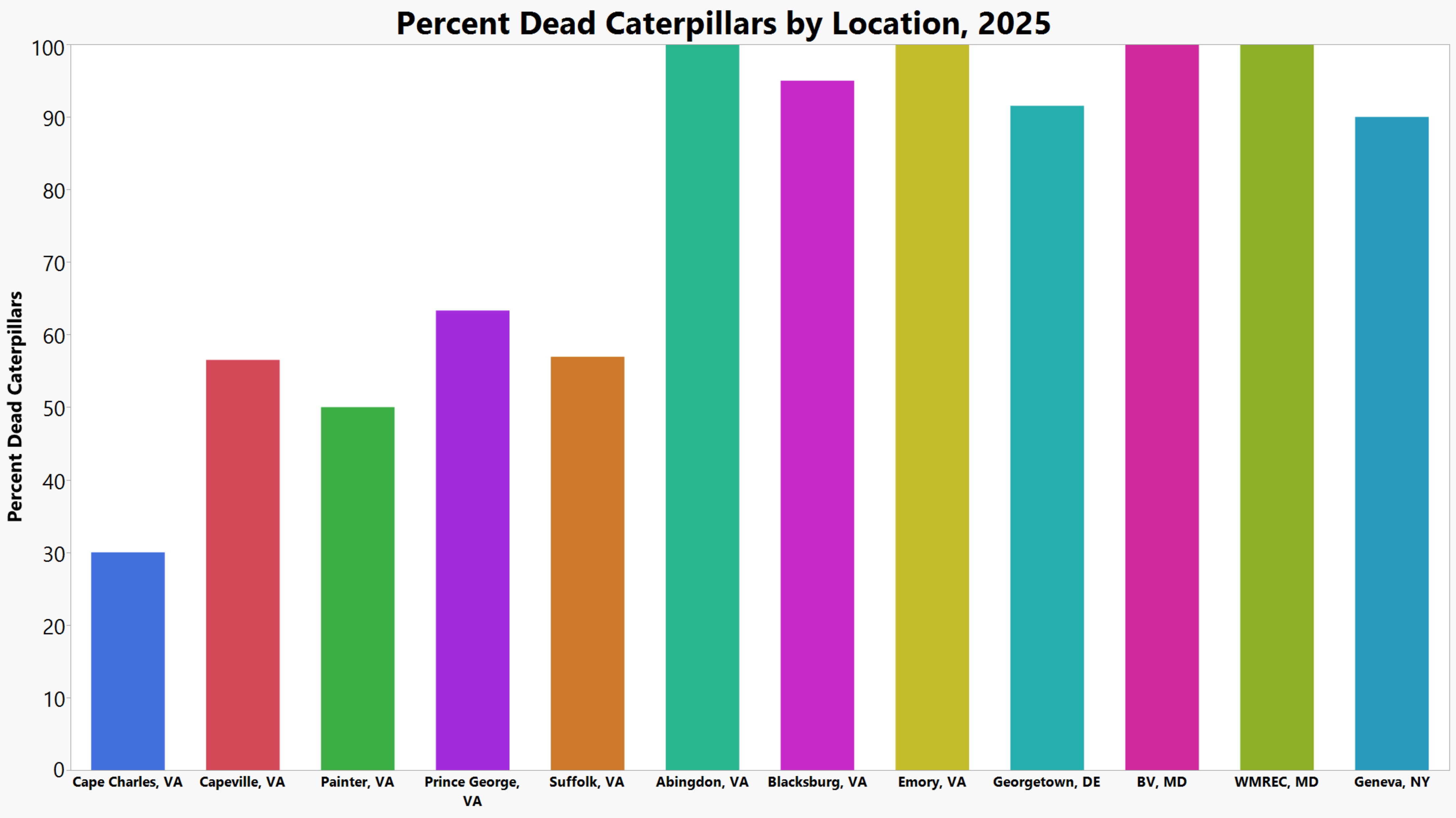
Percent Dead = Dead + Moribund



Bean Dip Bioassay Collection Sites

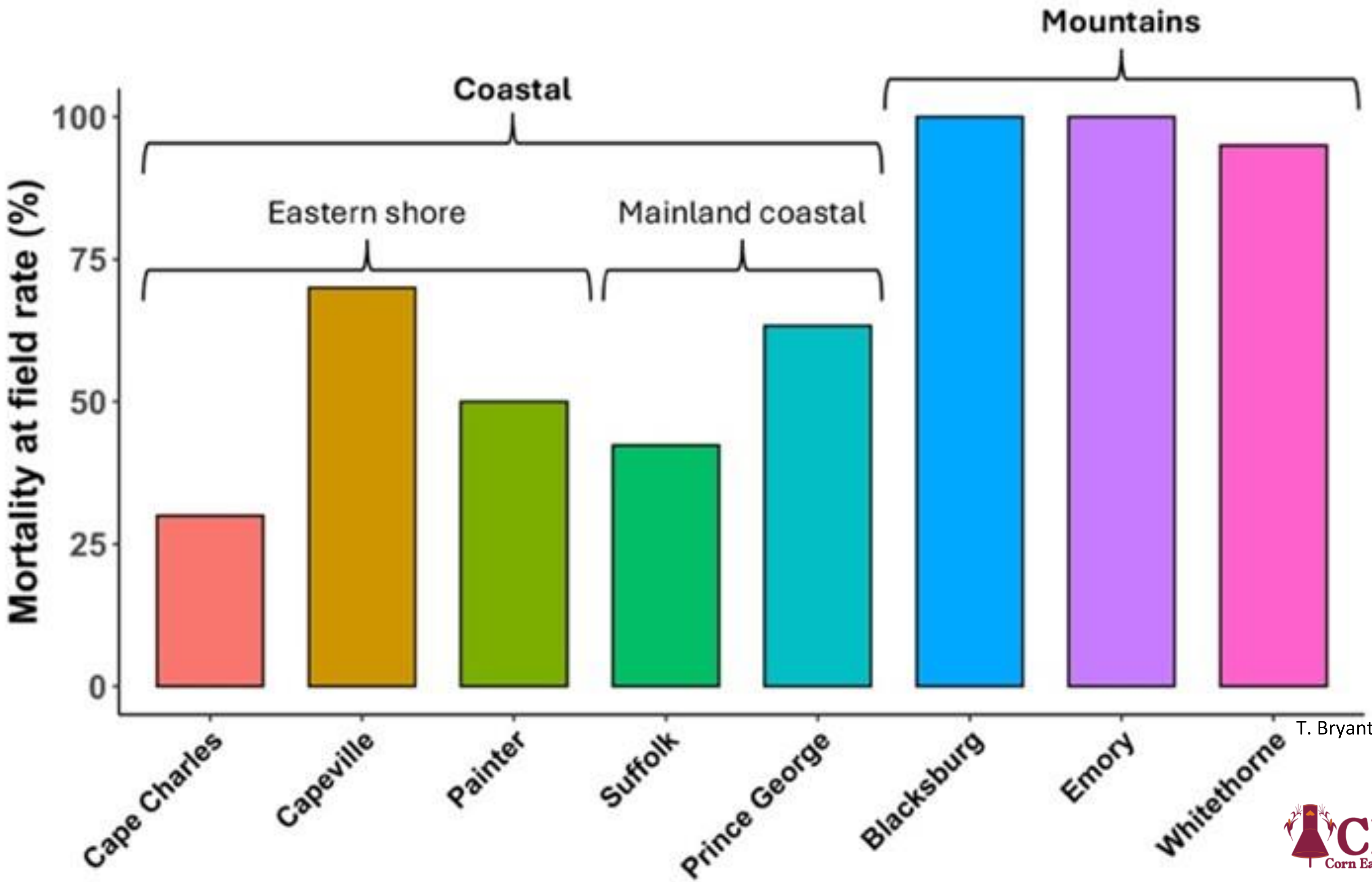


Corn Earworm Integrated Pest Management



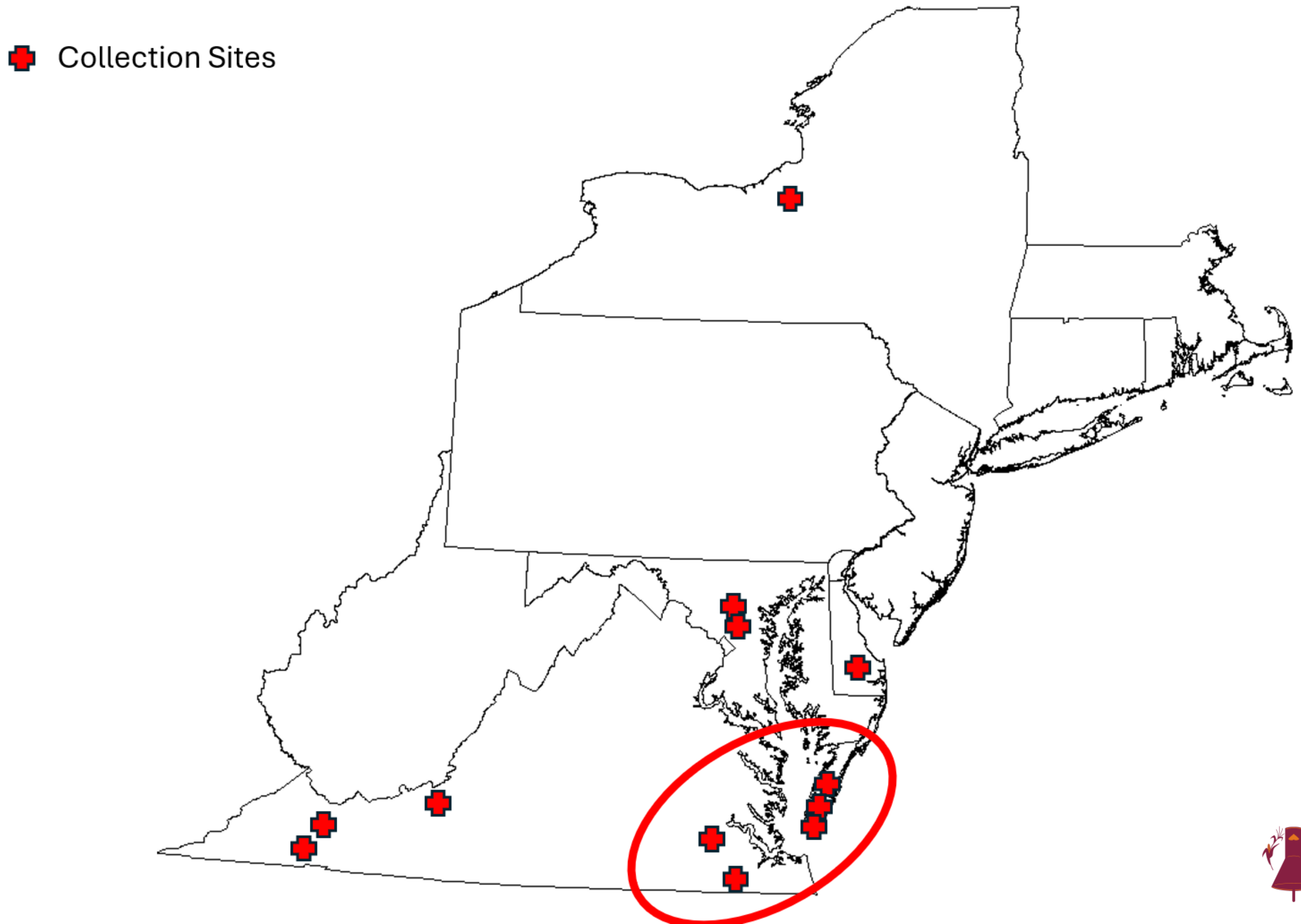
Percent Dead Caterpillars by Location, 2025
Percent Dead Caterpillars
100
90
80
70
60
50
40
30
20
10
0
Cape Charles, VA
Capeville, VA
Painter, VA
Prince George, VA
Suffolk, VA
Abingdon, VA
Blacksburg, VA
Emory, VA
Georgetown, DE
BV, MD
WMREC, MD
Geneva, NY

A close look at Virginia



T. Bryant

CEWIPM.org
Corn Earworm Integrated Pest Management


Collection Sites

Insecticide Efficacy Field Trial Results

Field Trial Materials and Methods

- Cultivar: American Dream
- Two row plots
- Sweet corn sprayed at frequency according to moth trap captures

CEWIPM.org
Corn Earworm Integrated Pest Management

Action Threshold-based spraying

Pheromone trap for corn earworm; 'Scentry Heliothis' type.

Average number of corn earworm moths per trap		Spray interval
Moths per day	Moths per week	
< 0.2	< 1.4	No spray
0.2 - 0.5	1.4 - 3.5	Every 5 days
0.5 - 1	3.5 - 7	Every 4 days
1 - 13	7 - 91	Every 3 days
>13	>91	Every 2 days

CEWIPM.org
Corn Earworm Integrated Pest Management

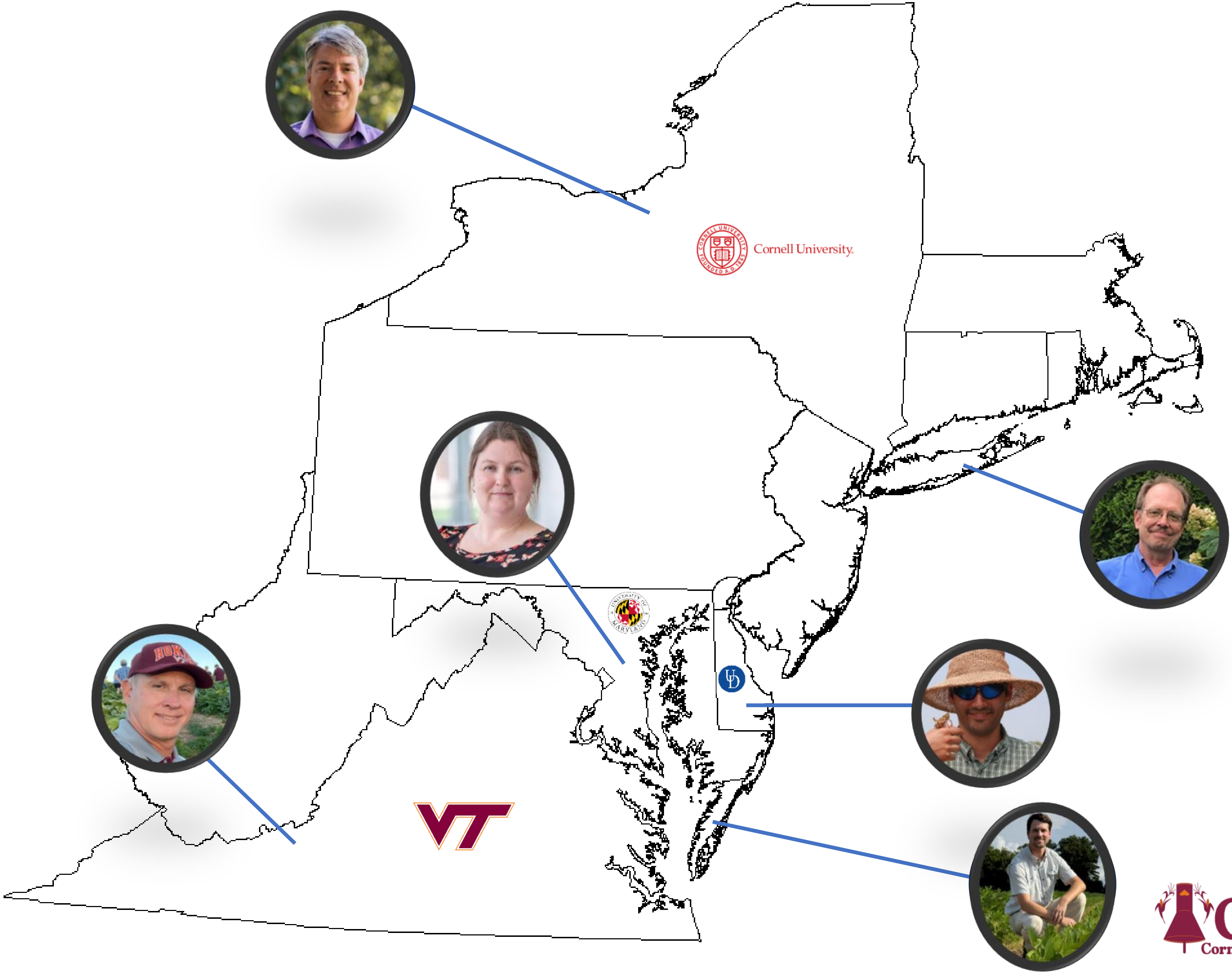
Field Trial Materials and Methods

- Cultivar: American Dream
- Two row plots in a RCBD
- Sweet corn sprayed starting at 5% silking and at a frequency according to moth trap captures
- 10 insecticide treatments

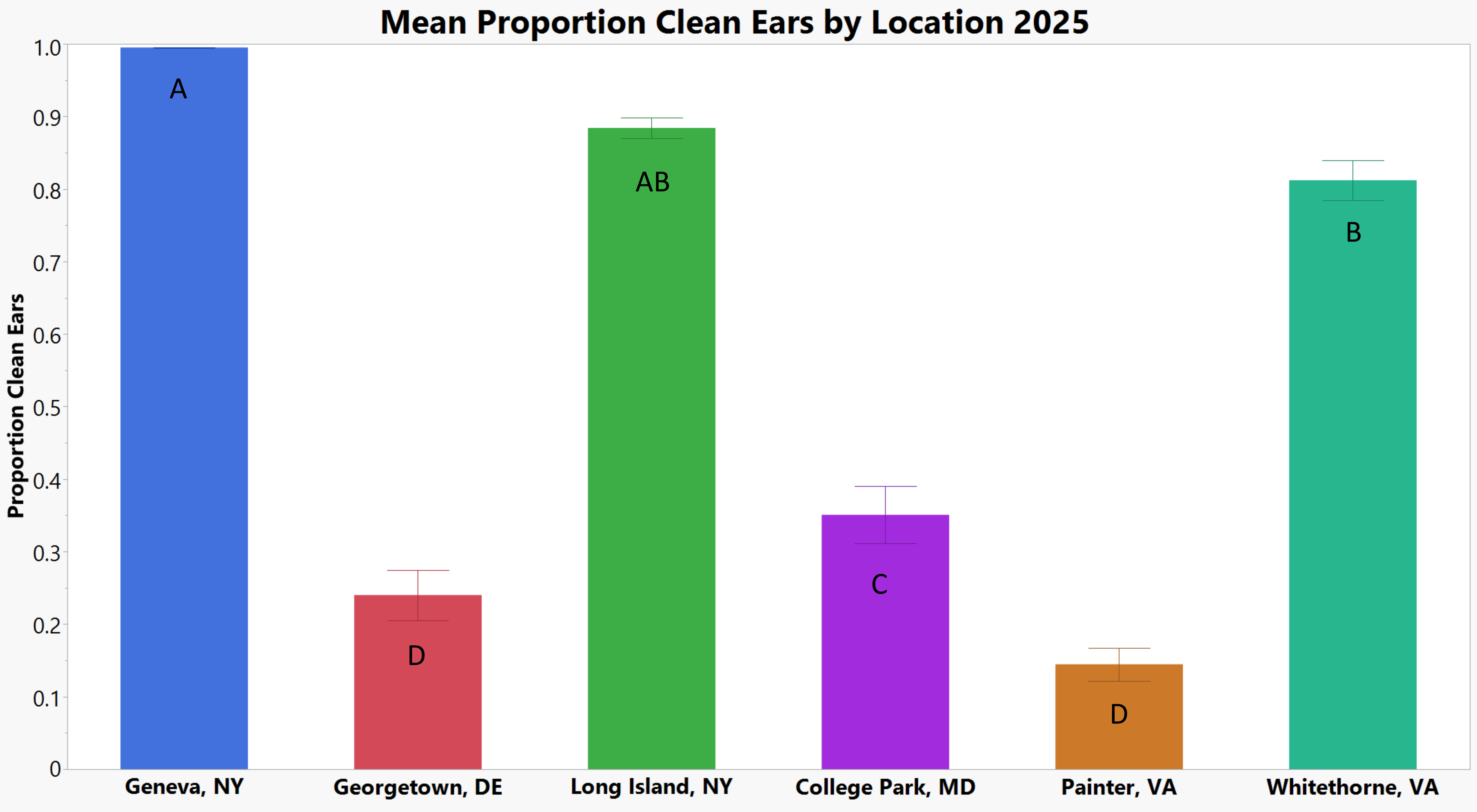
TREATMENT LIST		
#	TREATMENT	RATE/ ACRE in fl. oz
1	Untreated Control	0.00
2	Batallion 2EC	6.40
3	Besiege	10.00
4	Elevest	9.60
5	Hero EC	10.30
6	Lannate LV	24.00
7	Plinazolin 200SC	2.00
8	Radiant SC	6.00
9	Vantacor	2.50
10	Warrior II w/ Zeon	1.92

Field Trial Materials and Methods

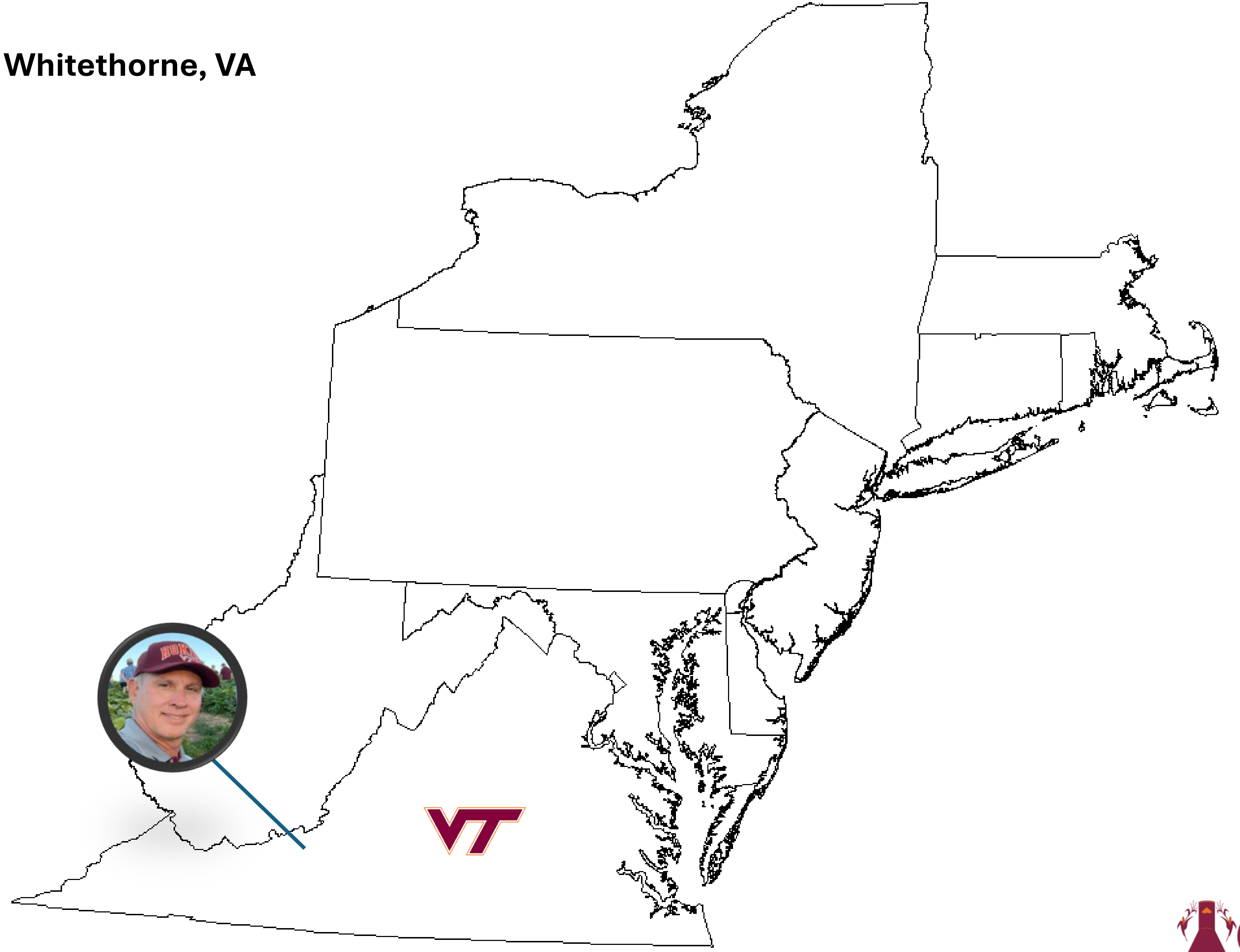
- Cultivar: American Dream
- Two row plots in a RCBD
- Sweet corn sprayed starting at 5% silking and at a frequency according to moth trap captures
- 10 insecticide treatments
- 30 corn ears randomly selected from each plot and evaluated for damage at harvest
- GLMM with a binomial distribution and logit link function (treatment and location as fixed effects)
- Smithson-Verkuilen transformation used on proportion clean ears
- ANOVA used for treatment x proportion clean ears at each location



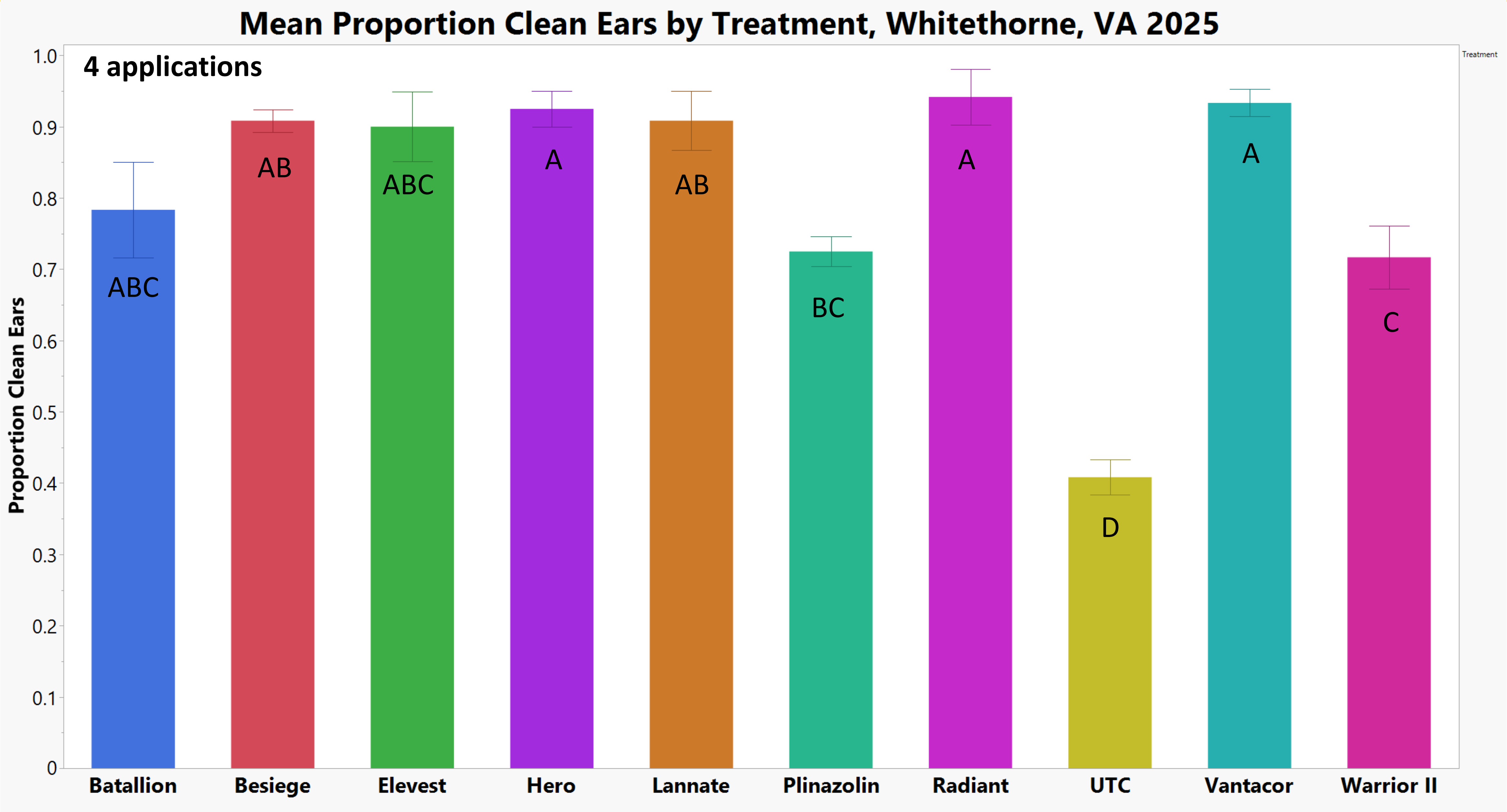
CEWIPM.org
Corn Earworm Integrated Pest Management


Mean Proportion Clean Ears by Location 2025
Proportion Clean Ears
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
A
D
AB
C
D
B
Geneva, NY
Georgetown, DE
Long Island, NY
College Park, MD
Painter, VA
Whitethorne, VA

Tom Kuhar, Whitethorne, VA

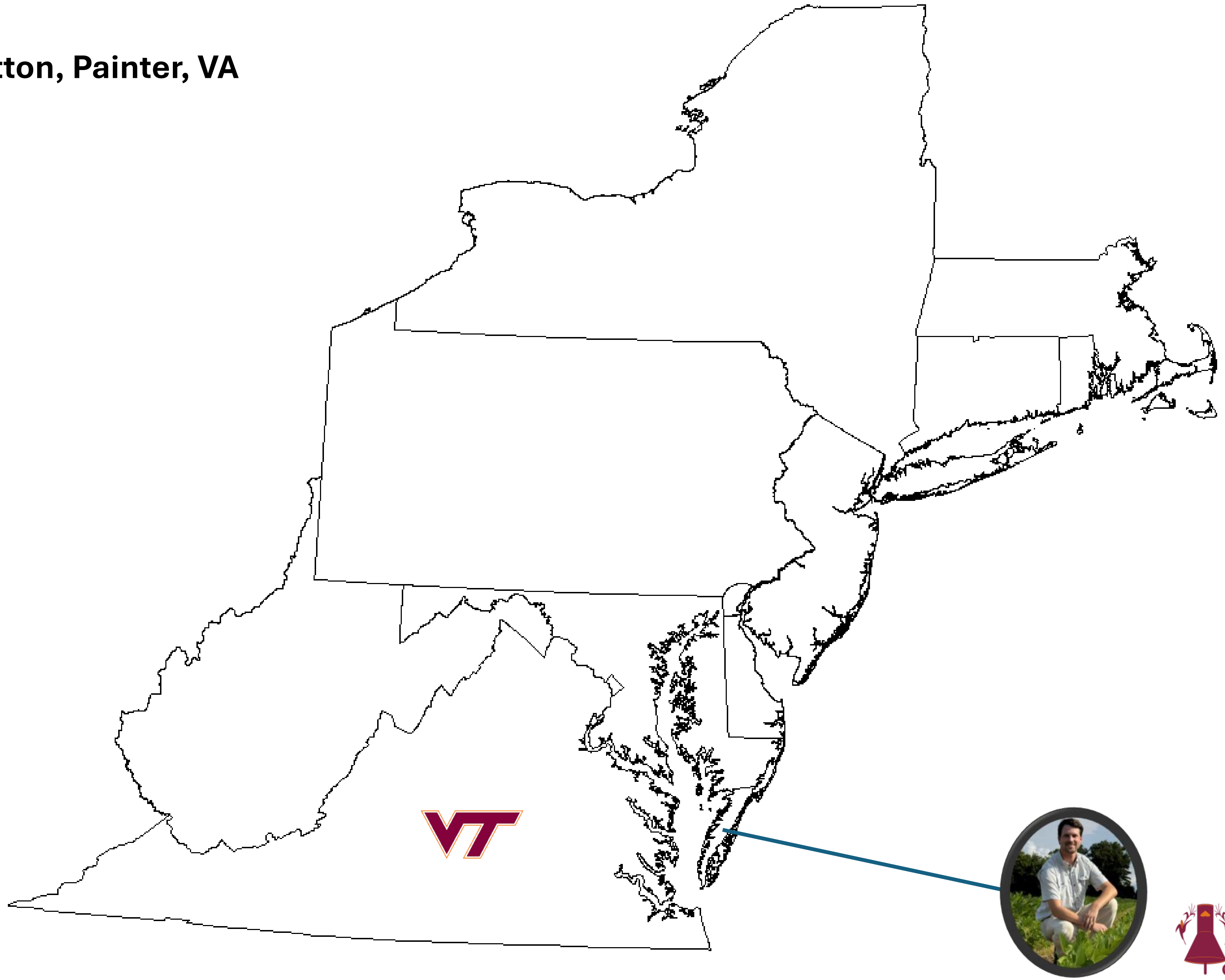


CEWIPM.org
Corn Earworm Integrated Pest Management

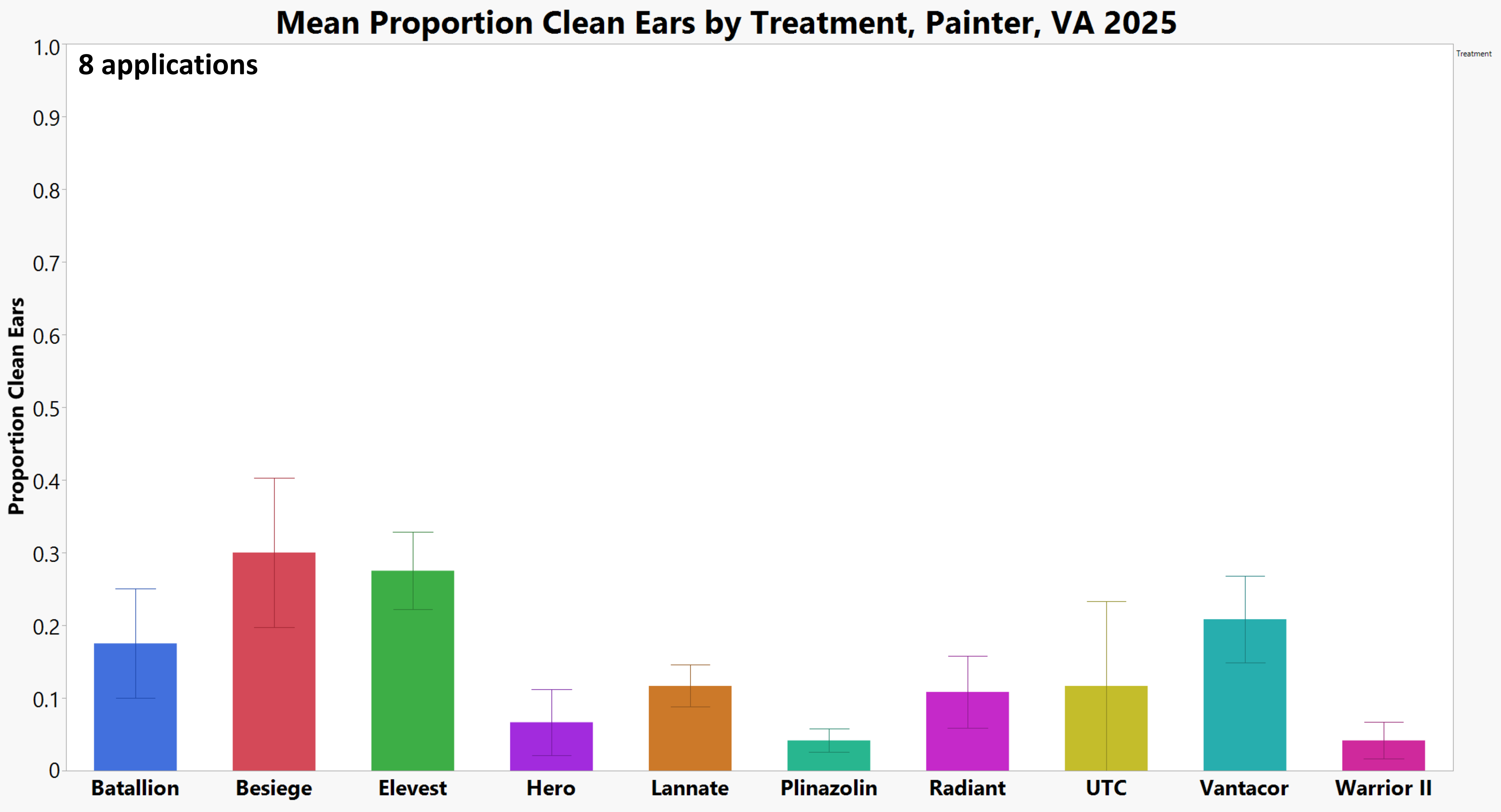


Mean Proportion Clean Ears by Treatment, Whitethorne, VA 2025
4 applications
Treatment
Proportion Clean Ears
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
ABC
AB
ABC
A
AB
BC
A
D
A
C
Batallion
Besiege
Elevest
Hero
Lannate
Plinazolin
Radiant
UTC
Vantacor
Warrior II

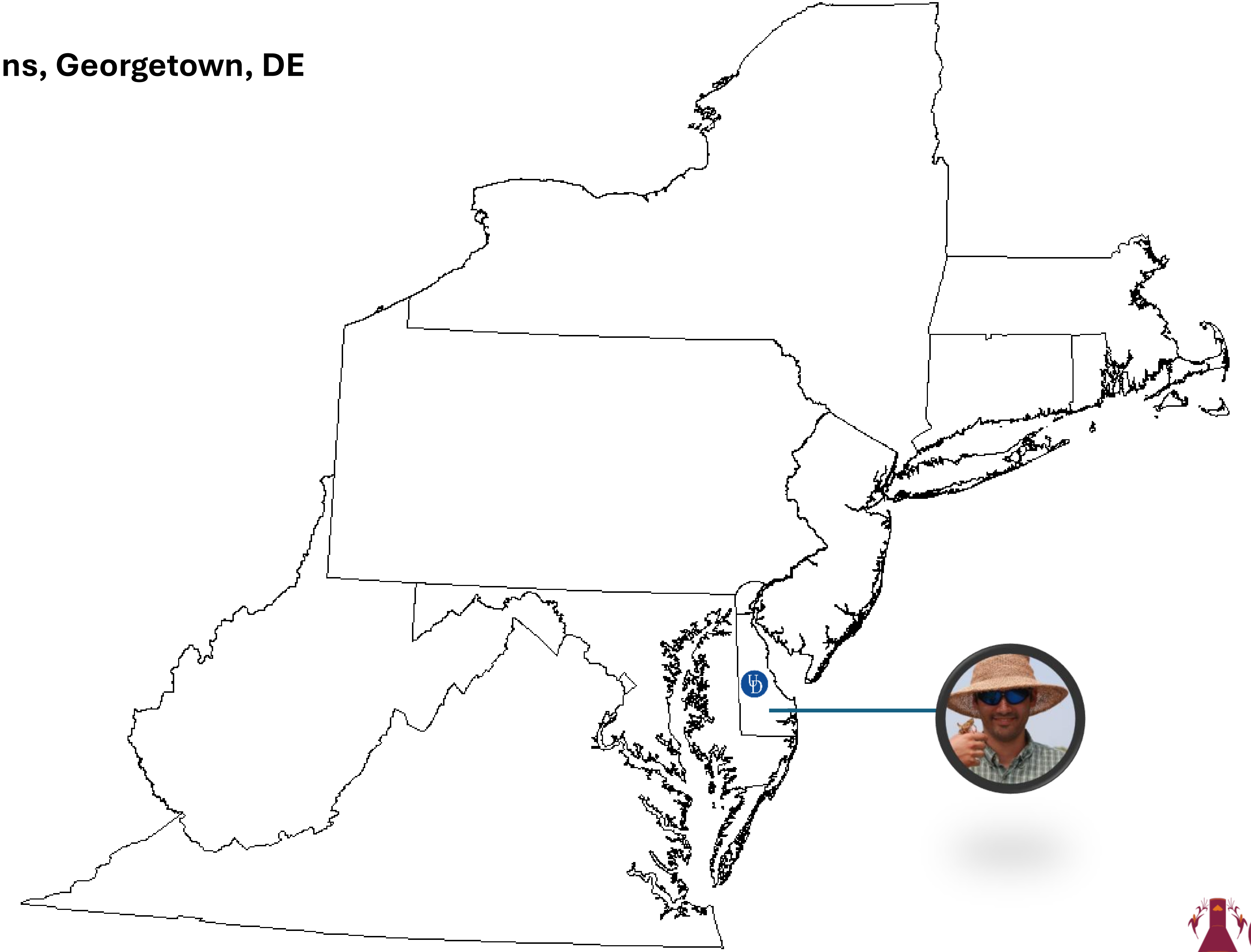
Kemper Sutton, Painter, VA



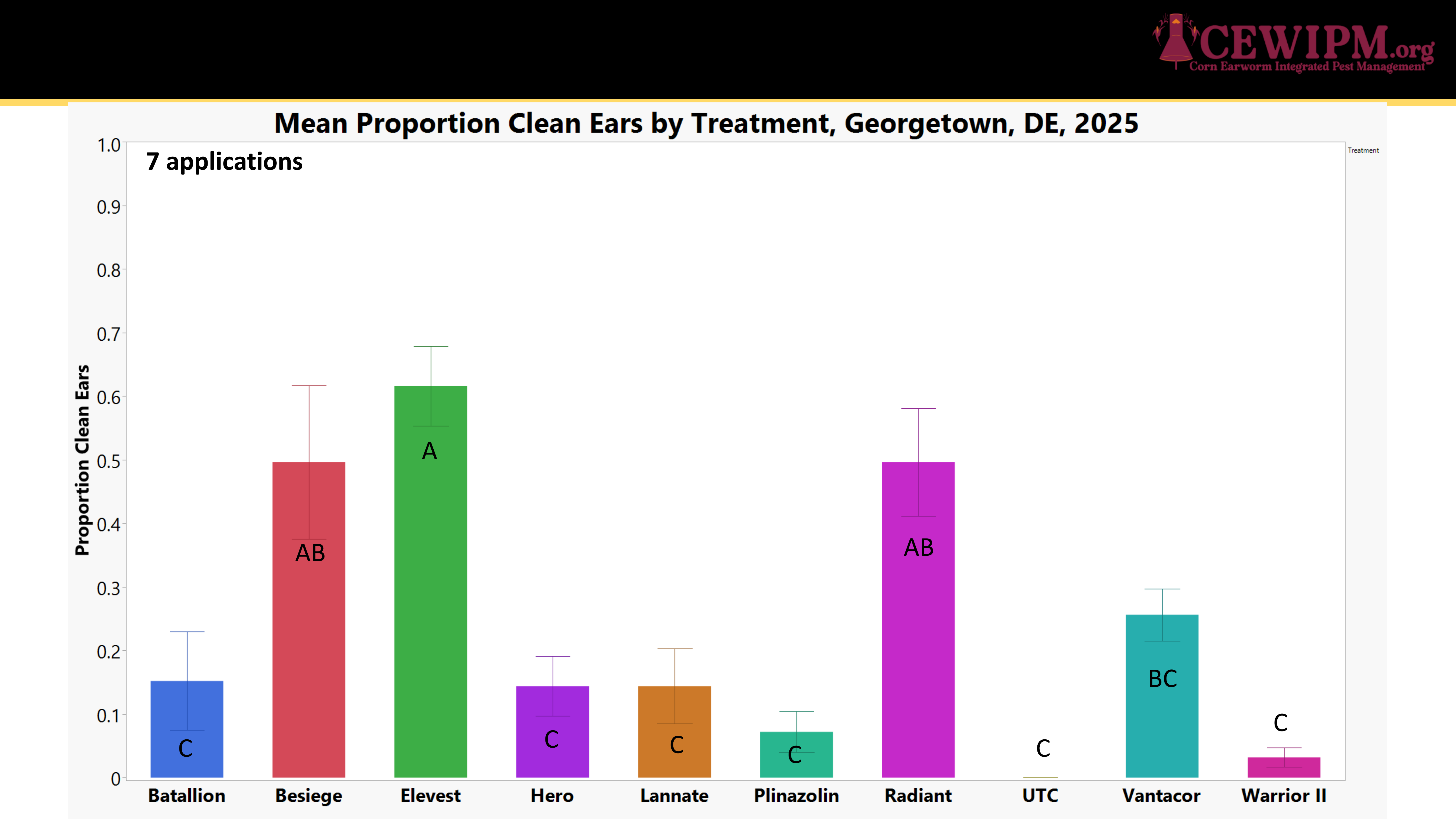
CEWIPM.org
Corn Earworm Integrated Pest Management


Mean Proportion Clean Ears by Treatment, Painter, VA 2025
8 applications
Treatment
Proportion Clean Ears
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Batallion
Besiege
Elevest
Hero
Lannate
Plinazolin
Radiant
UTC
Vantacor
Warrior II

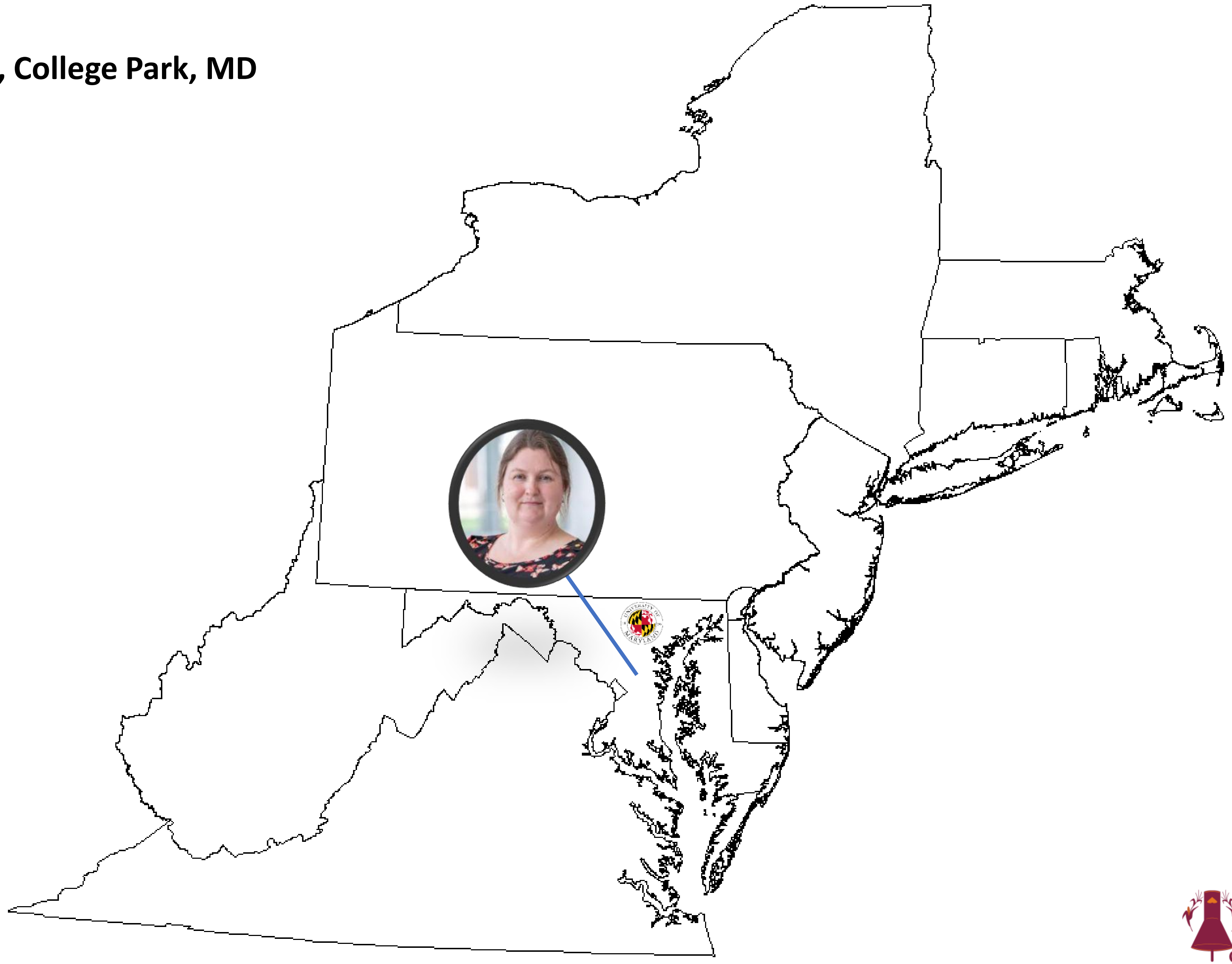
David Owens, Georgetown, DE



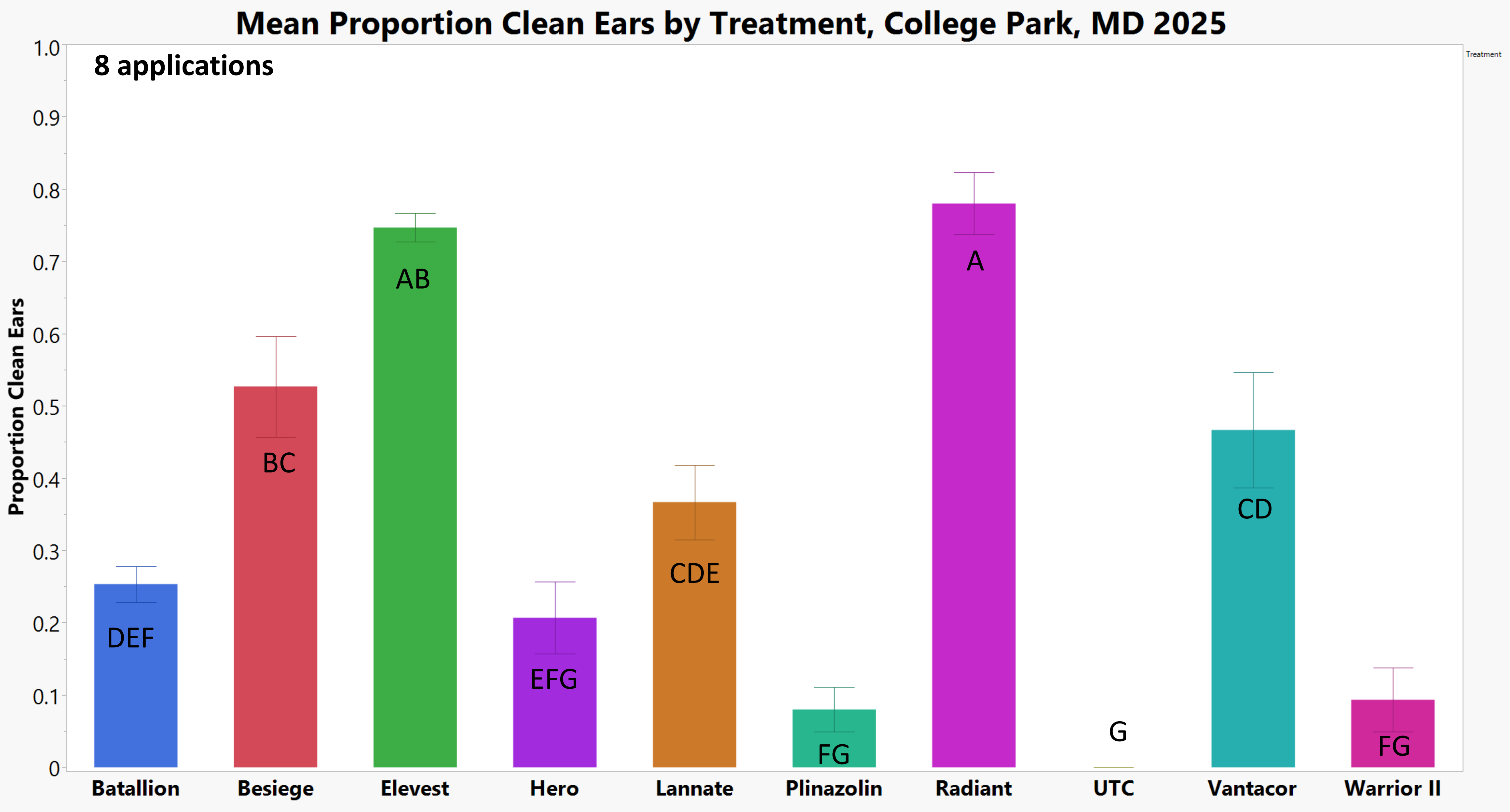
CEWIPM.org
Corn Earworm Integrated Pest Management


CEWIPM.org
Corn Earworm Integrated Pest Management
Mean Proportion Clean Ears by Treatment, Georgetown, DE, 2025
7 applications
Proportion Clean Ears
Treatment
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
C
AB
A
C
C
C
AB
C
BC
C
Batallion
Besiege
Elevest
Hero
Lannate
Plinazolin
Radiant
UTC
Vantacor
Warrior II

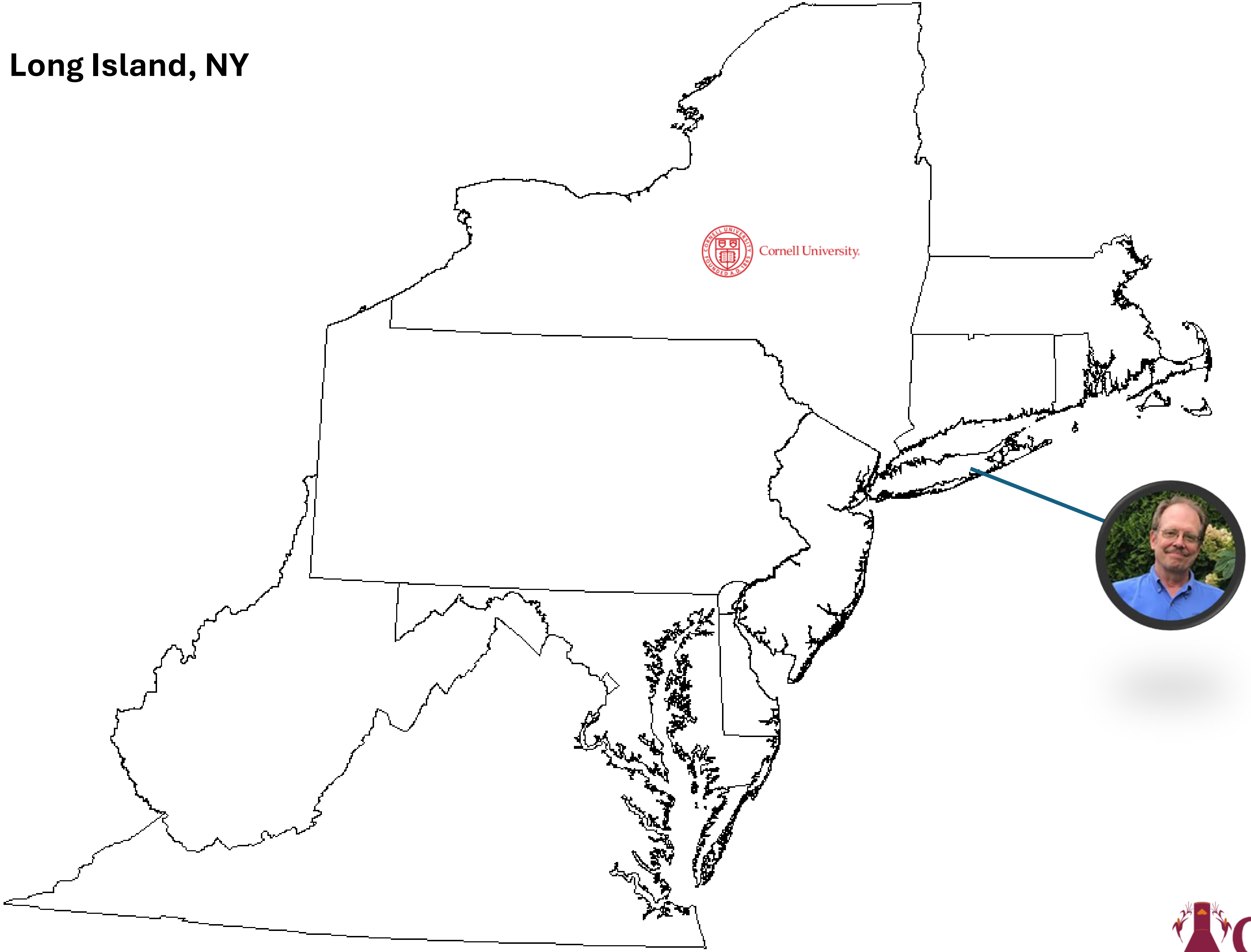
Kelly Hamby, College Park, MD



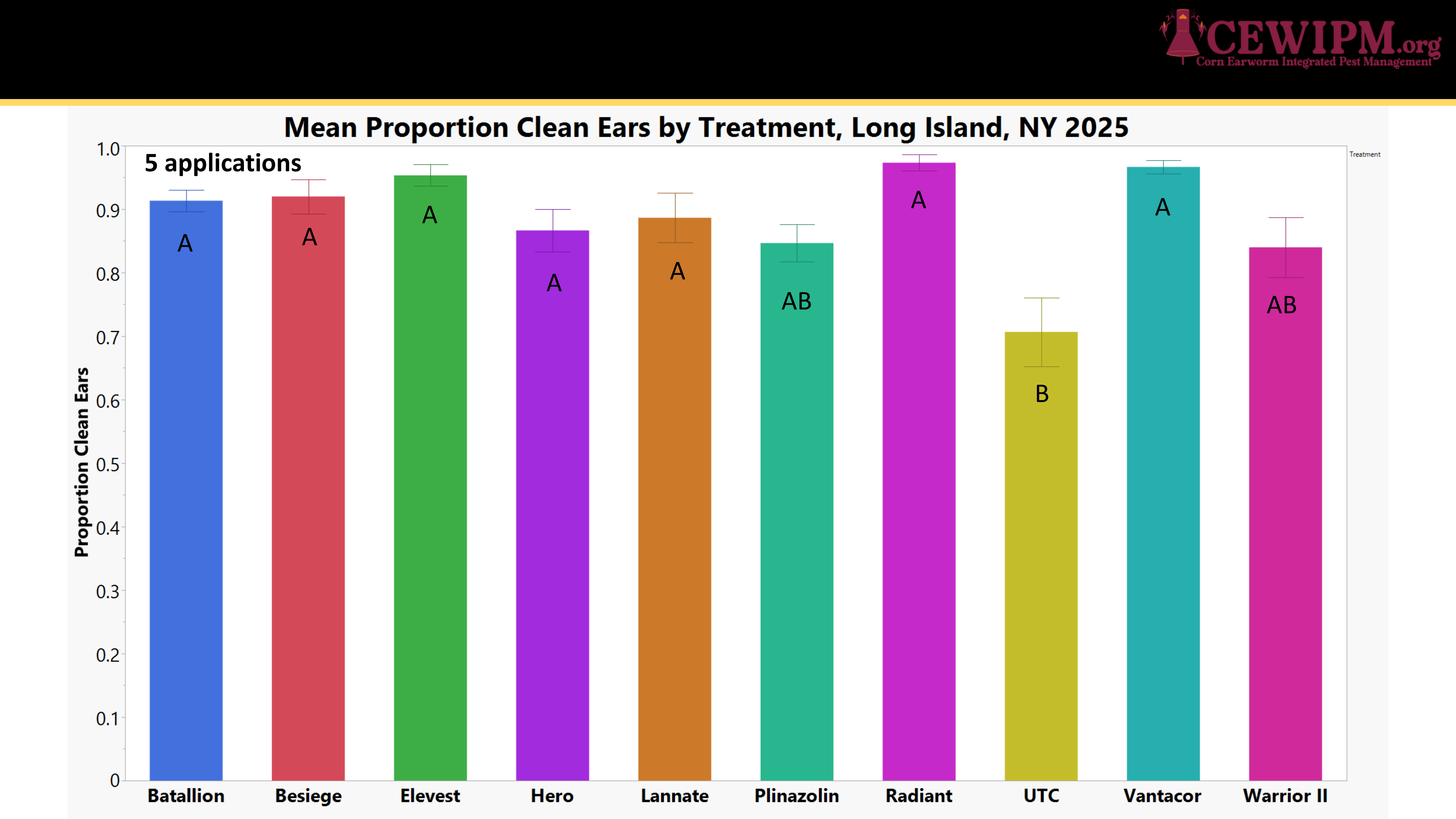
CEWIPM.org
Corn Earworm Integrated Pest Management


Mean Proportion Clean Ears by Treatment, College Park, MD 2025
8 applications
Proportion Clean Ears
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Treatment
DEF
BC
AB
EFG
CDE
FG
A
G
CD
FG
Batallion
Besiege
Elevest
Hero
Lannate
Plinazolin
Radiant
UTC
Vantacor
Warrior II

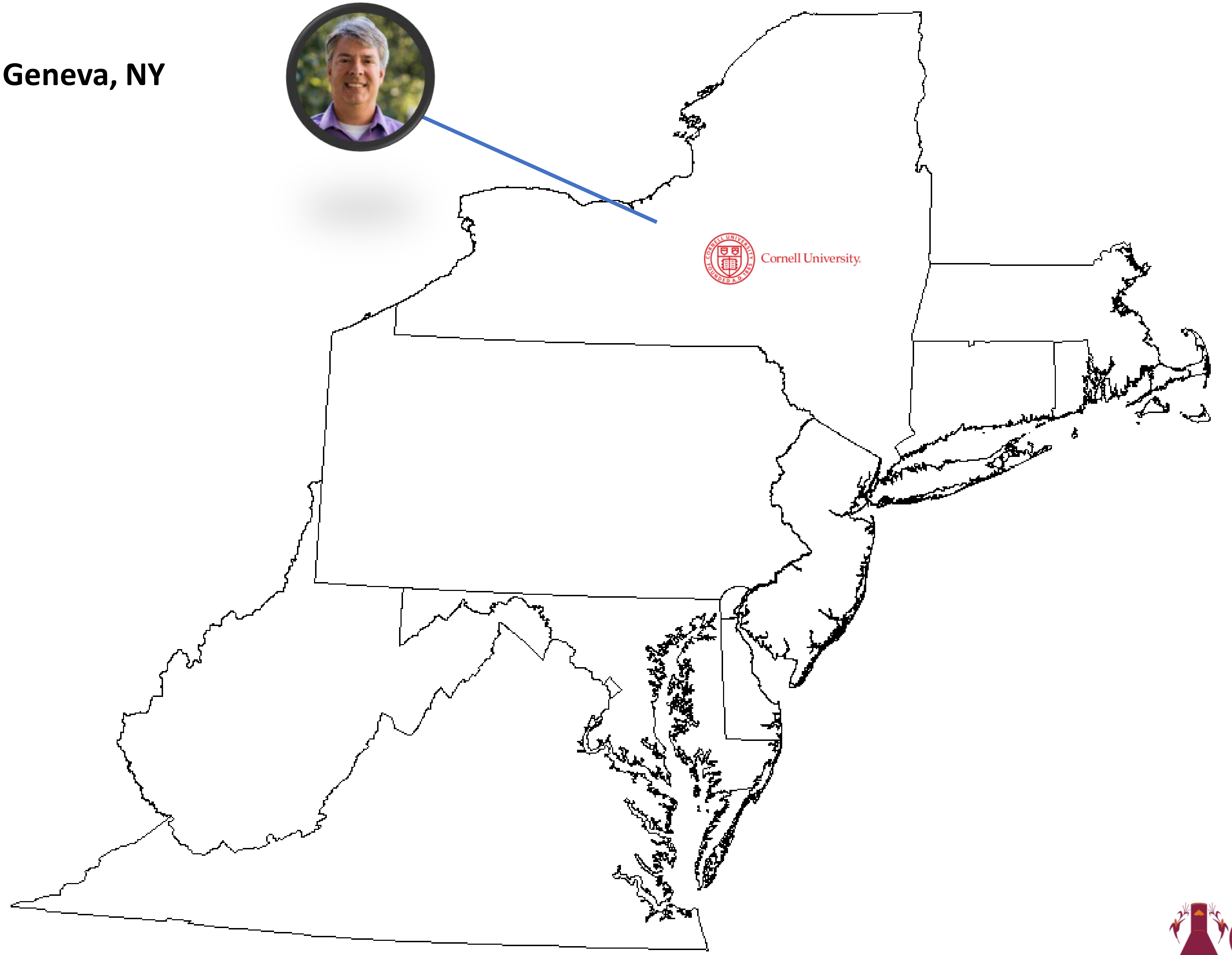
Dan Gilrein, Long Island, NY



CEWIPM.org
Corn Earworm Integrated Pest Management

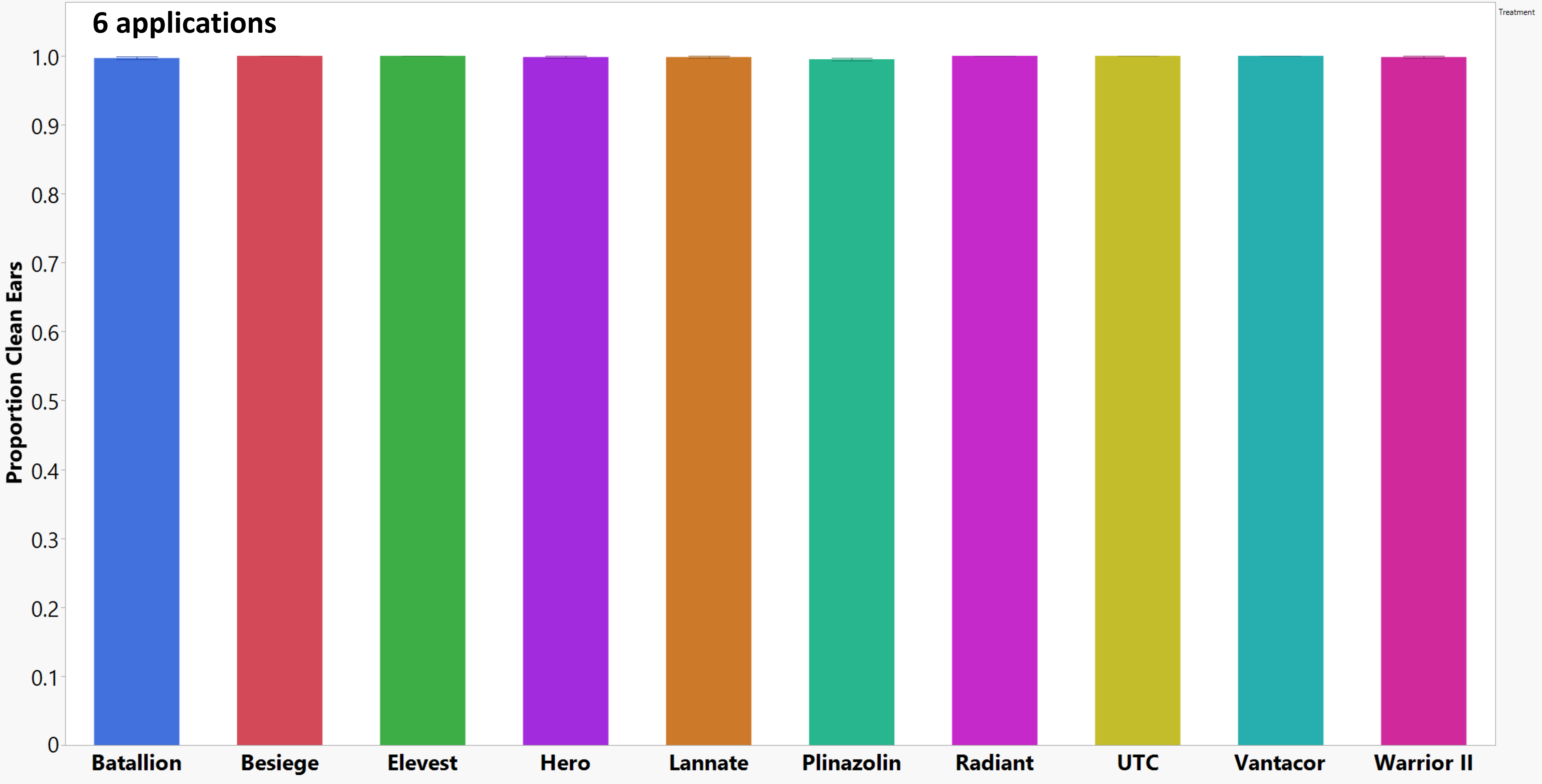

CEWIPM.org
Corn Earworm Integrated Pest Management
Mean Proportion Clean Ears by Treatment, Long Island, NY 2025
5 applications
Proportion Clean Ears
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Treatment
A
A
A
A
A
AB
A
B
A
AB
Batallion
Besiege
Elevest
Hero
Lannate
Plinazolin
Radiant
UTC
Vantacor
Warrior II

Brian Nault, Geneva, NY



CEWIPM.org
Corn Earworm Integrated Pest Management

Mean Proportion Clean Ears by Treatment, Geneva, NY 2025



Take Aways

- Field Spray Trial
  - Thresholds worked at northern locations and mixed results in southern areas
  - Heavy infested areas may need to begin 1st application prior to 5% silking
  - Combo products generally preformed the best and Radiant was consistently comparable.

- Bean Dip Bioassays:
  - Reduced diamide efficacy in SE/ES VA
  - However, zero reported field failures
  - Expanding testing in VA in 2026

CEWIPM.org
Corn Earworm Integrated Pest Management

Questions?

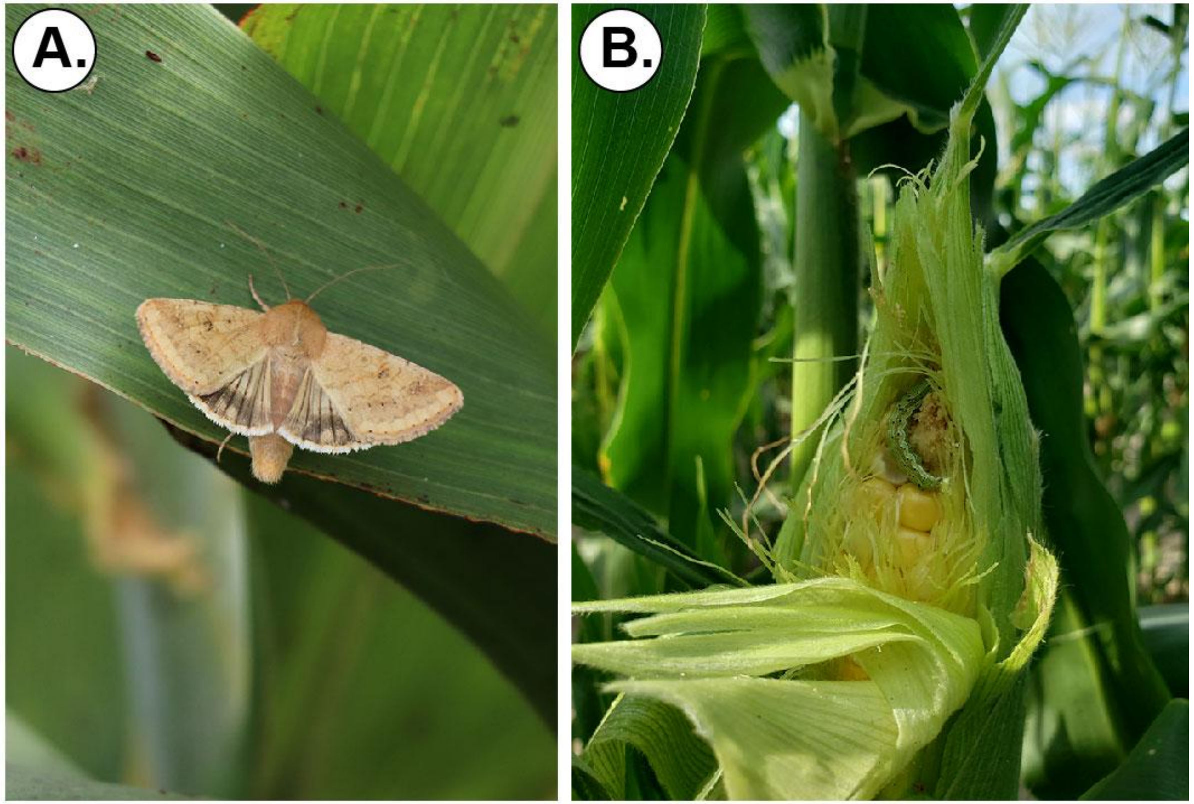
Spray frequency evaluation on Bt and non-Bt sweet corn

Anders Huseth
Assistant Professor & Extension Specialist
Michigan State University
huseth@msu.edu

CEWIPM.org

Problem

- Foliar sprays for earworm have been a primary line of defense for decades
- Release of Bt sweet corn provides another option to control larvae
- Widespread Bt resistance erodes value of technology
- The interaction between Bt and insecticides may improve control outcomes



CEWIPM.org
Corn Earworm Integrated Pest Management

Objective & Goal

The goal of this objective will be to evaluate CEW thresholds across a broad geography.

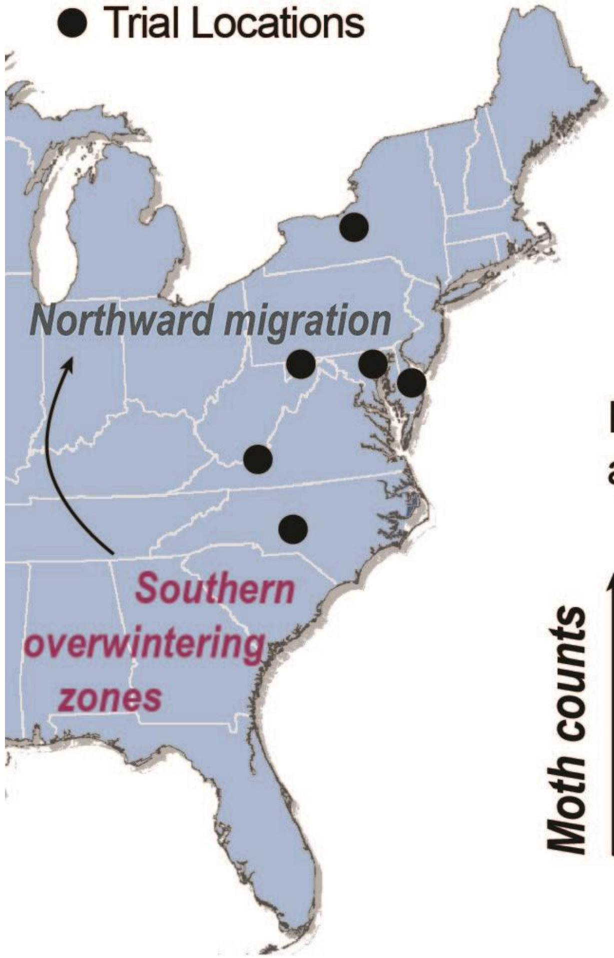
We tested Bt/non-Bt hybrids to identify vulnerabilities in existing thresholds

Study design:

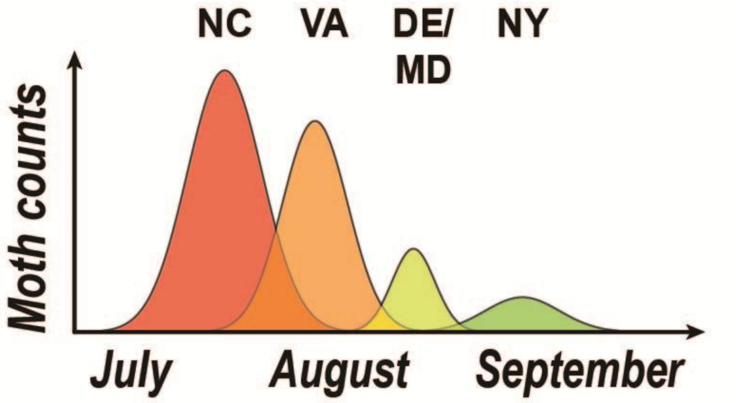
- Paired planting of Obsession I (non-Bt) and II (Cry1a.105+Cry2ab2 Bt) in VA, MD, NY, and NC (*2024 only*)
- Vantacor spray (chlorantraniliprole) at different times
- Monitored moth activity around plots to classify relative risk (VT-harvest)

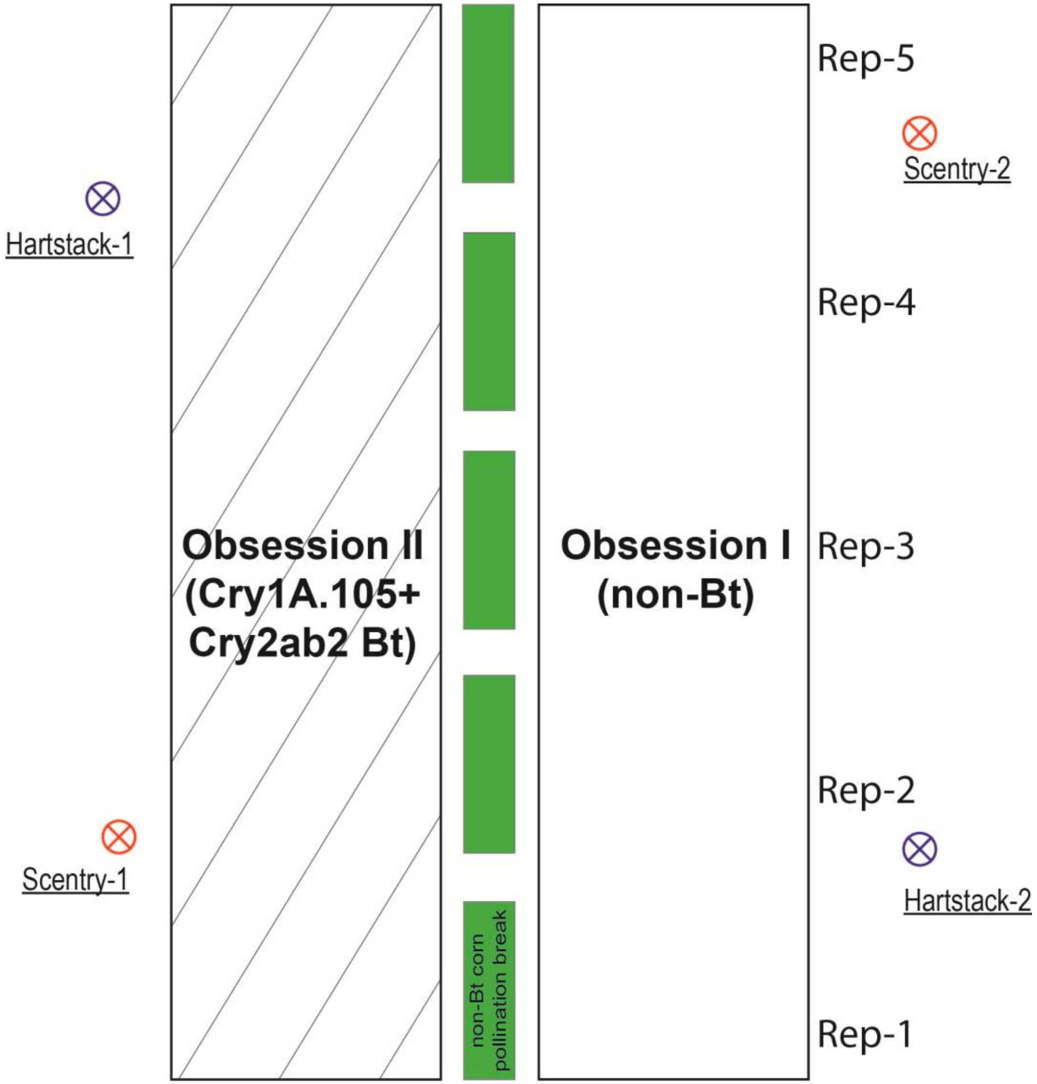
CEWIPM.org
Corn Earworm Integrated Pest Management

Study locations



Infestation timing and pressure varies among locations



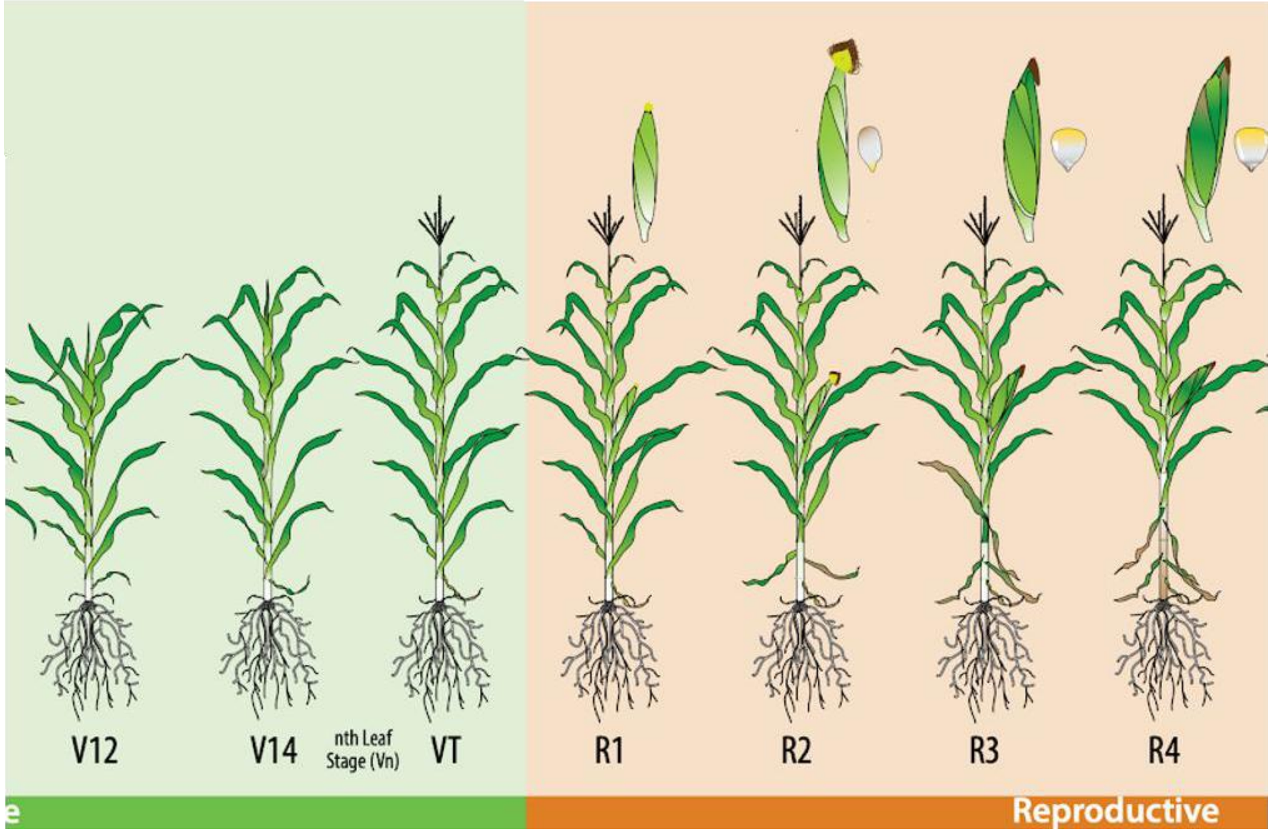


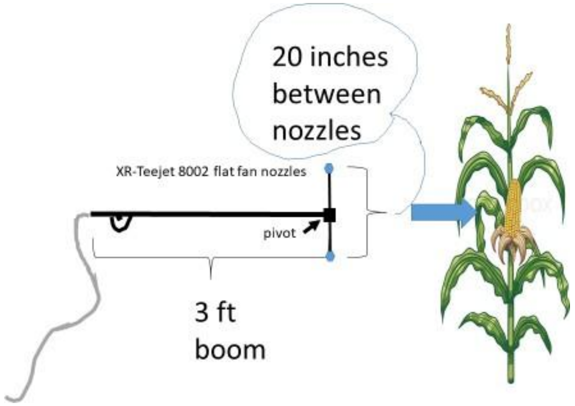
CEWIPM.org
Corn Earworm Integrated Pest Management

Study design

Vantacor spray intervals

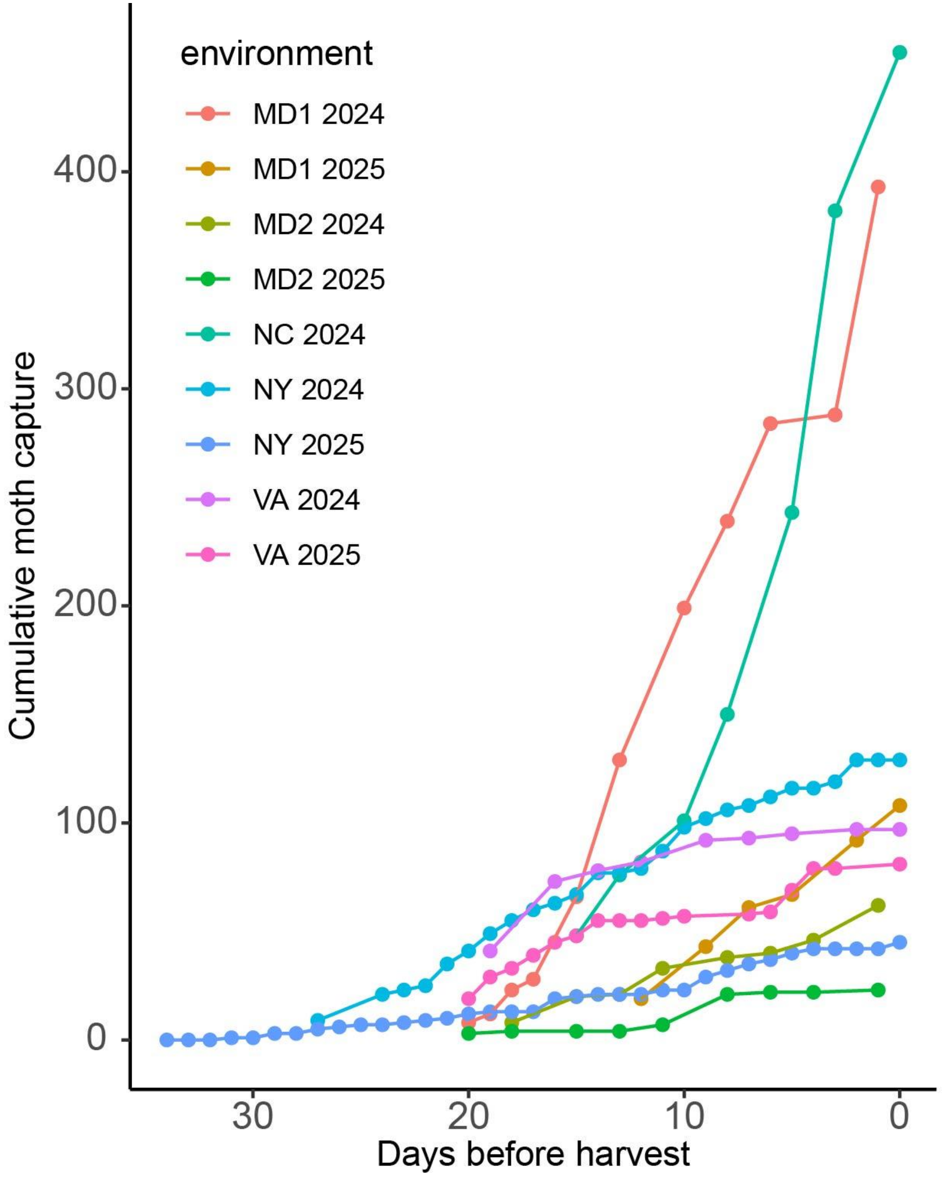
Day of week:	M	T	W	R	F	S	U	M	T	W	R	F	S	U
7 day:	S							S						
4 day:	S				S			S				S		
2 day:	S		S		S			S		S		S		





CEWIPM.org
Corn Earworm Integrated Pest Management

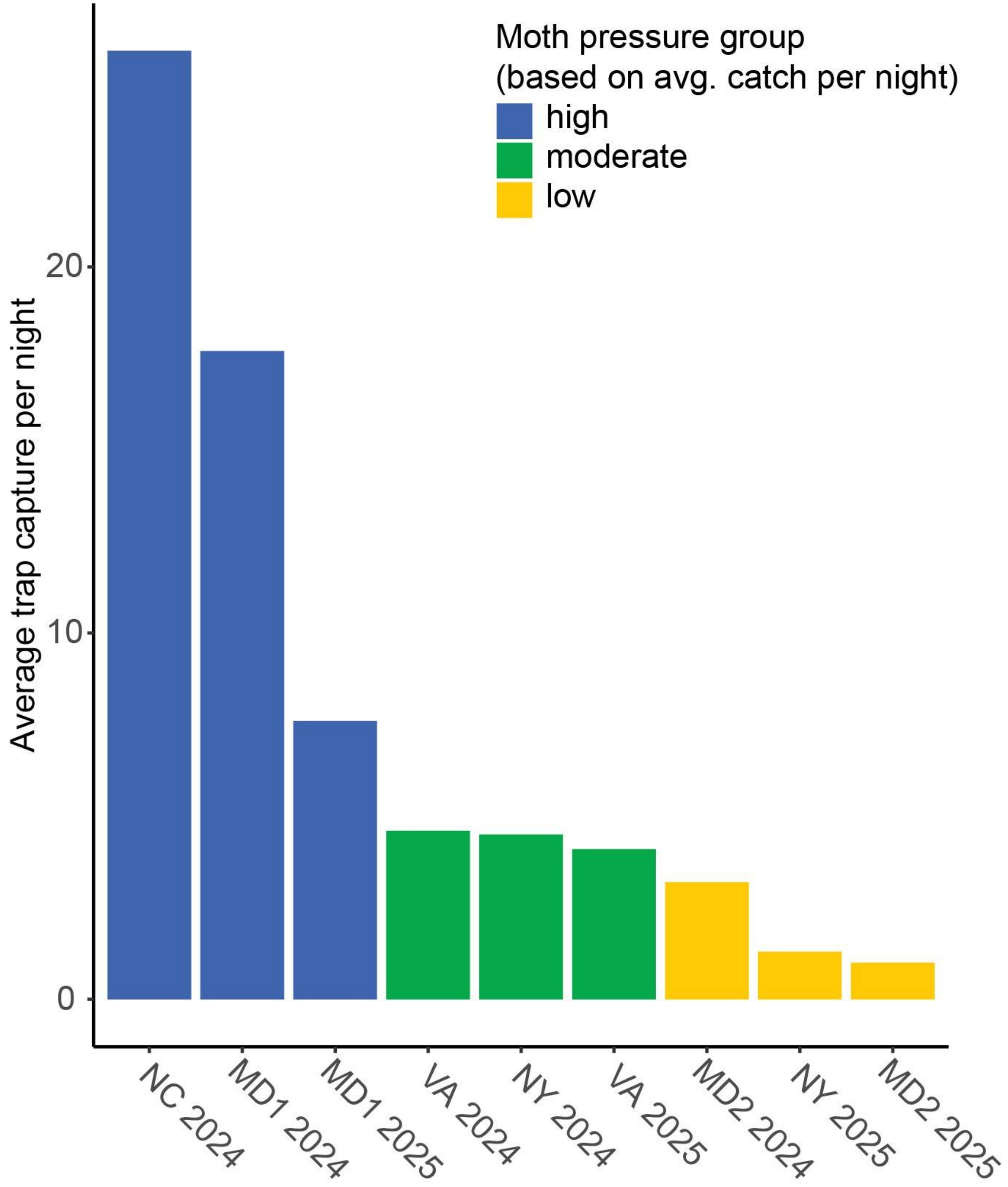
Moth activity across locations



- Trapping initiated shortly before spray program initiation at green silk
- Clear differences in moth activity across the locations
- Duration between VT and harvest was different
- Cumulative moths helps divide locations into high, moderate, and low pressure environments

CEWIPM.org
Corn Earworm Integrated Pest Management

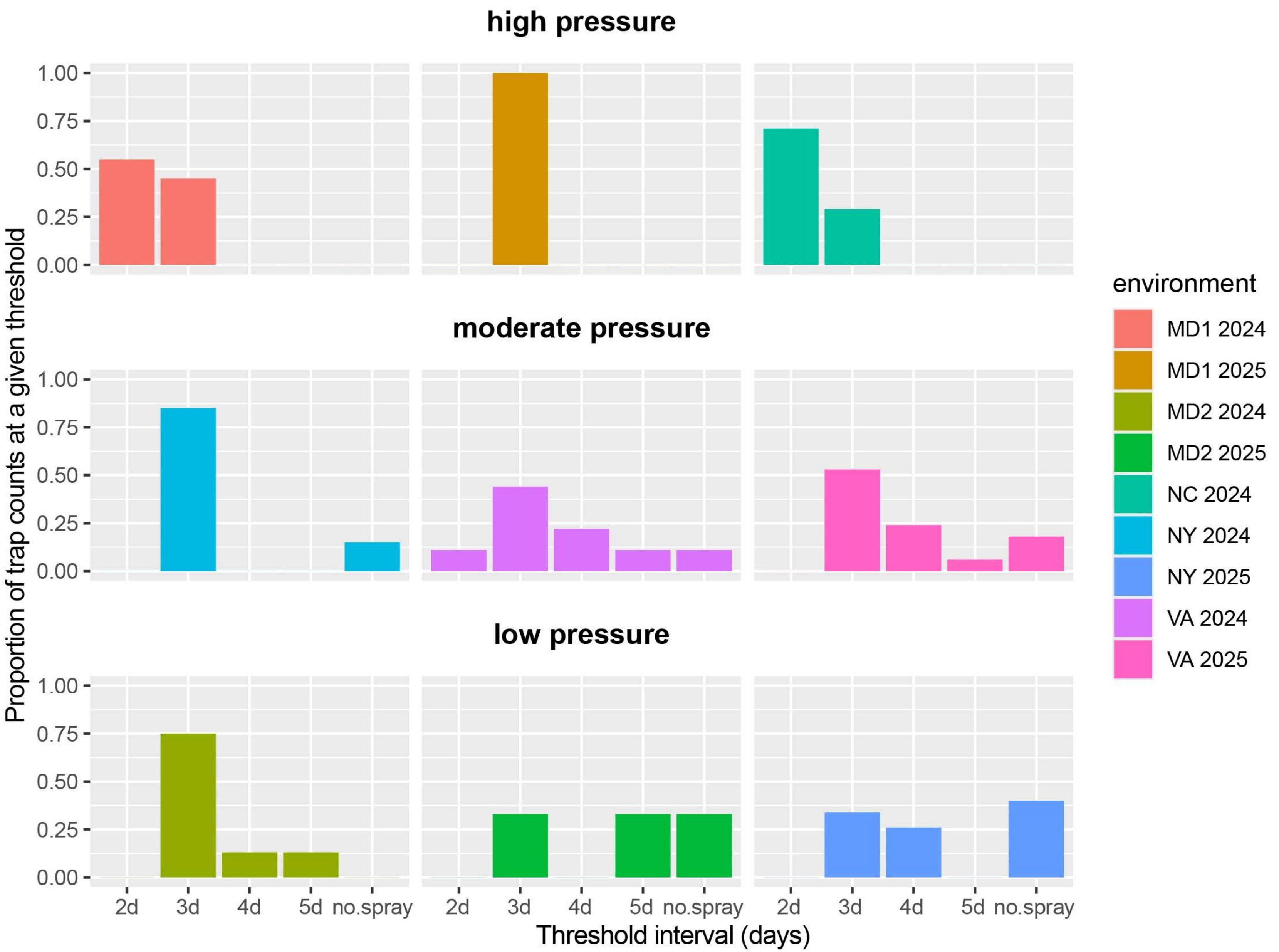
Nightly activity used for analysis



- Average nightly pressure was used to partition groups before analysis
- This helps evaluate benefits of Bt and intensive sprays

CEWIPM.org
Corn Earworm Integrated Pest Management

Spray threshold frequency based on traps

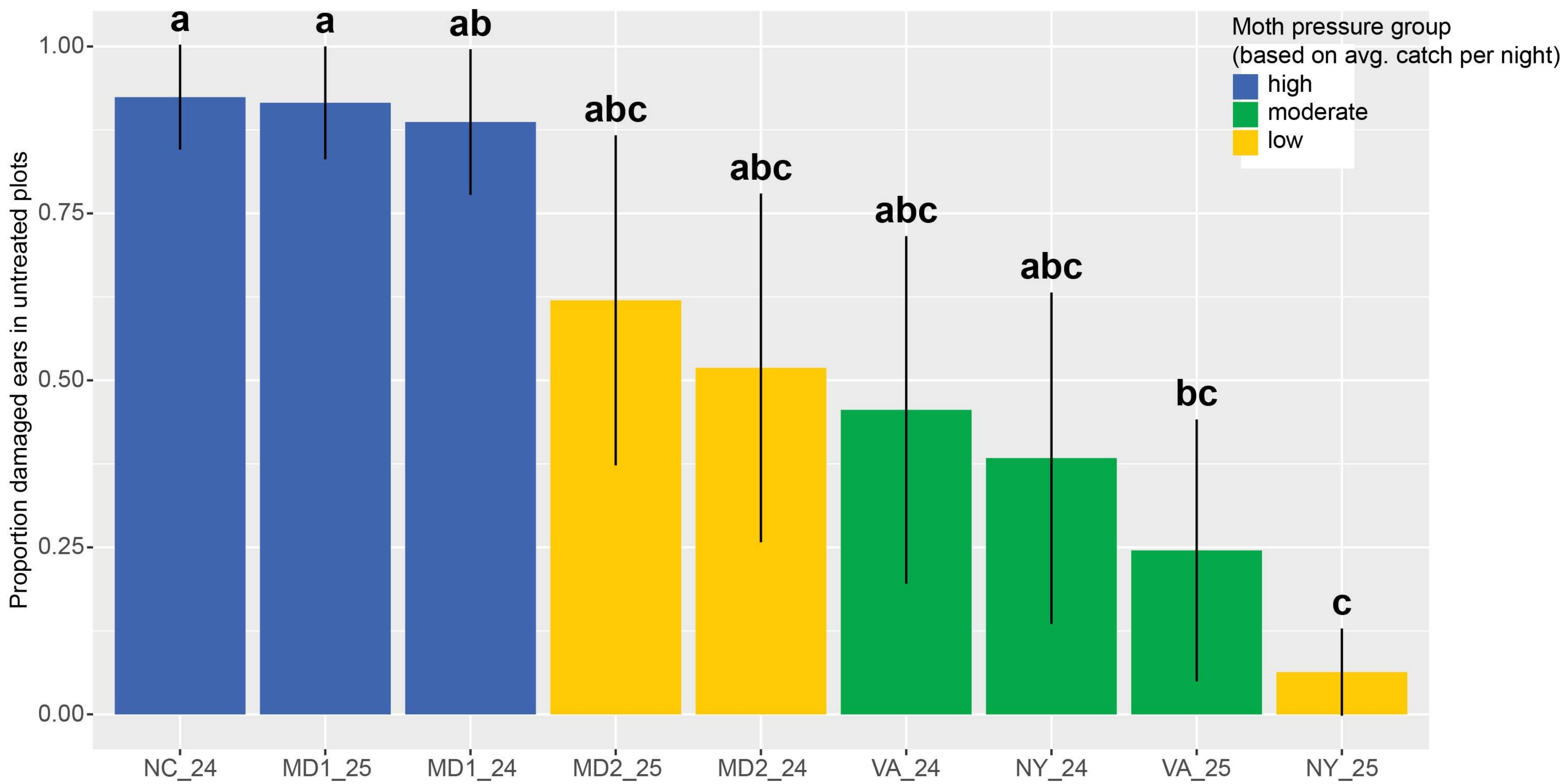


- High pressure environments (top) tended to have short recommended intervals
- Moderate were a mix of timings
- Low tended to have more “no spray” instances

CEWIPM.org
Corn Earworm Integrated Pest Management

Frequency of damaged ears

- Unsprayed non-Bt plots highlight pressure differences among locations and years. Loose agreement with moth pressure classification



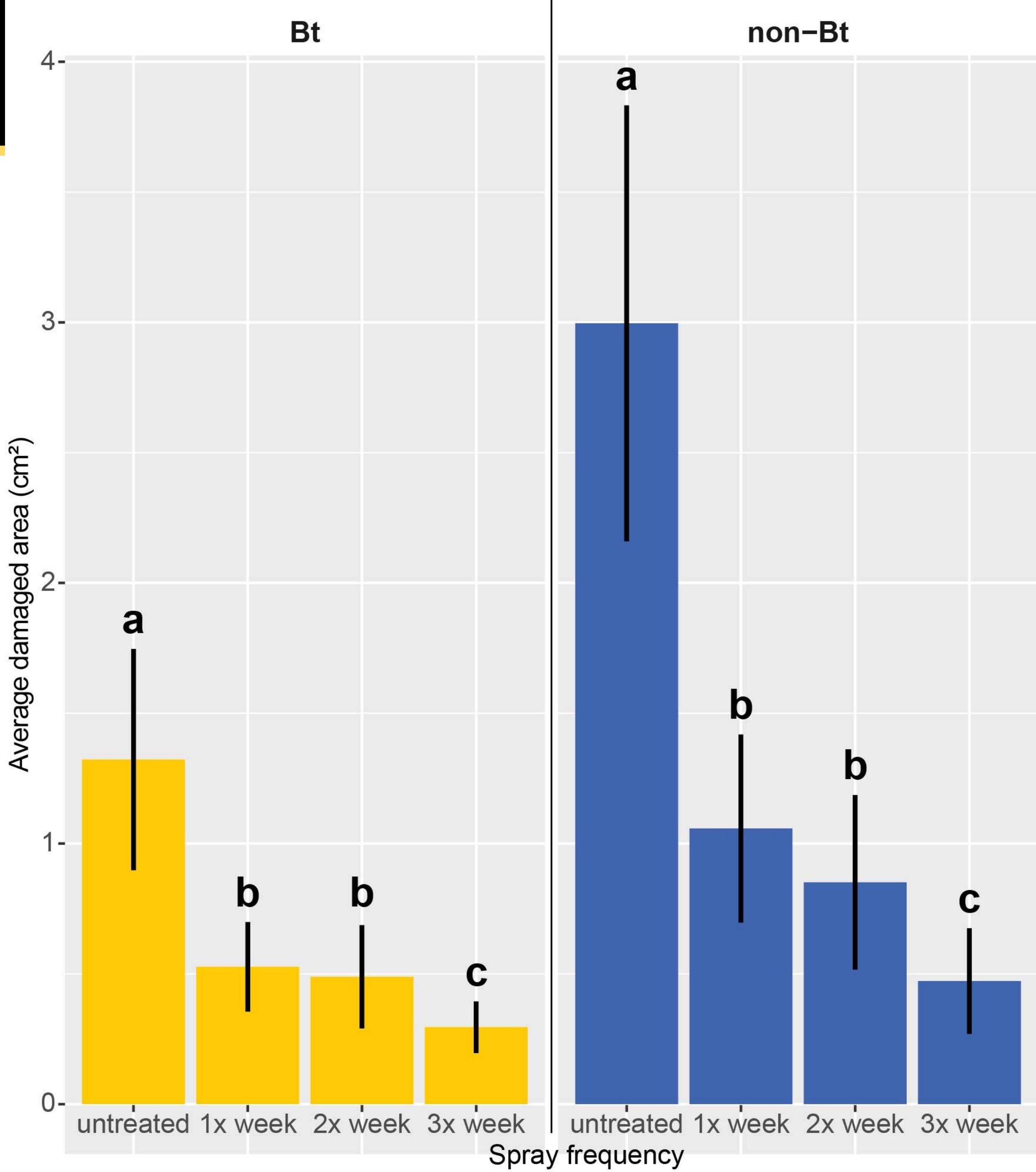
Do sprays reduce damage severity?

- Significant interactions between Bt toxin presence and spray frequency
- Bt plots consistently reduced ear injury severity across pressure groups (no interaction)
- Addition of sprays resulted in a similar trend

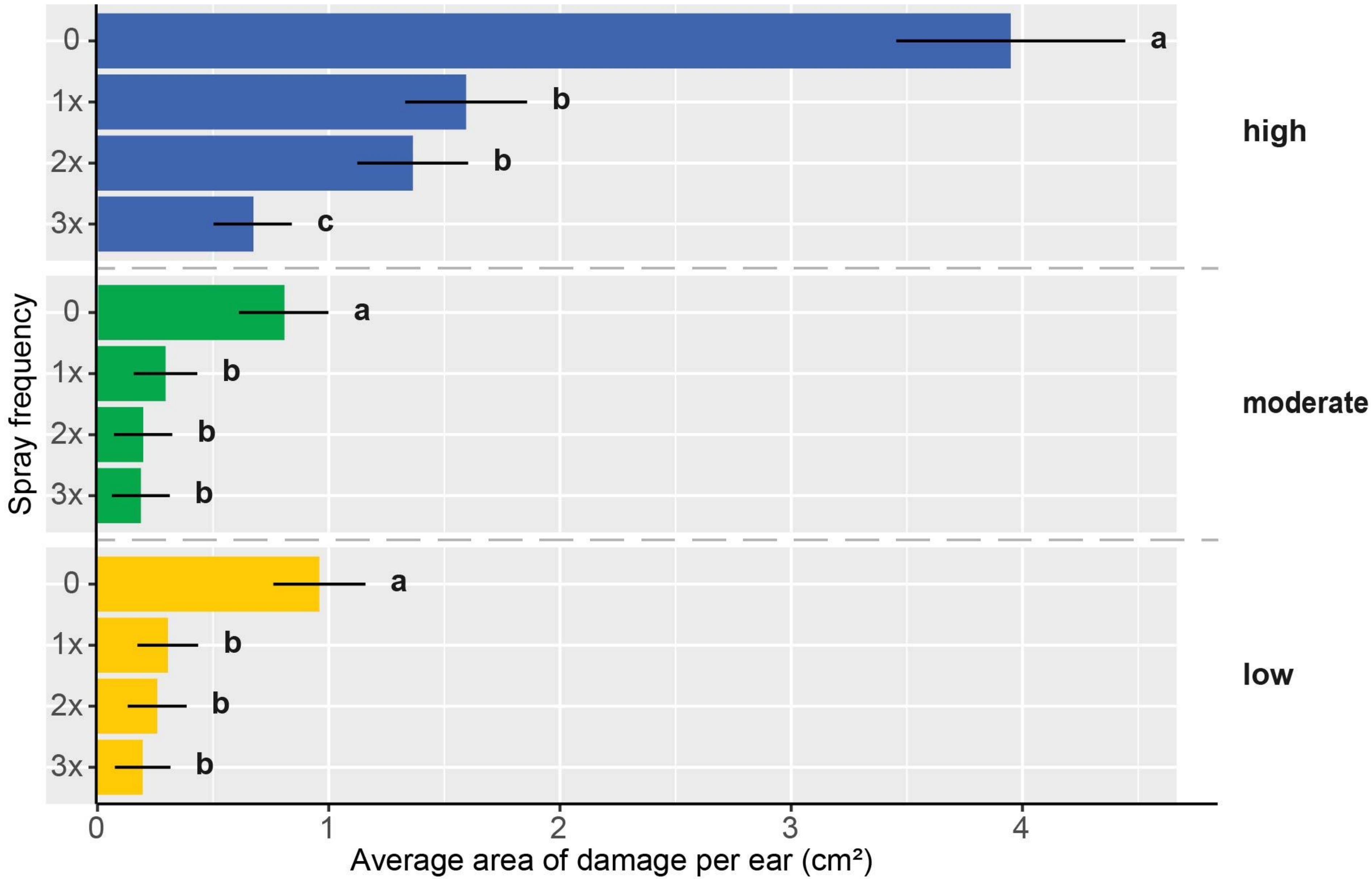
GLMM Predictor	Significance
Pressure group	***
Toxin	*
Spray Frequency	***
Toxin x spray	***
Pressure x toxin	ns
Pressure x Frequency	***

Benefit of Bt + sprays?

- Means separations nested within Bt (●) & non-Bt (●) groups
- Significantly fewer damaged ears in Bt than non-Bt in unsprayed plots
- Marginal Bt technology when intensive sprays are used
- Results similar for proportion of ear damage

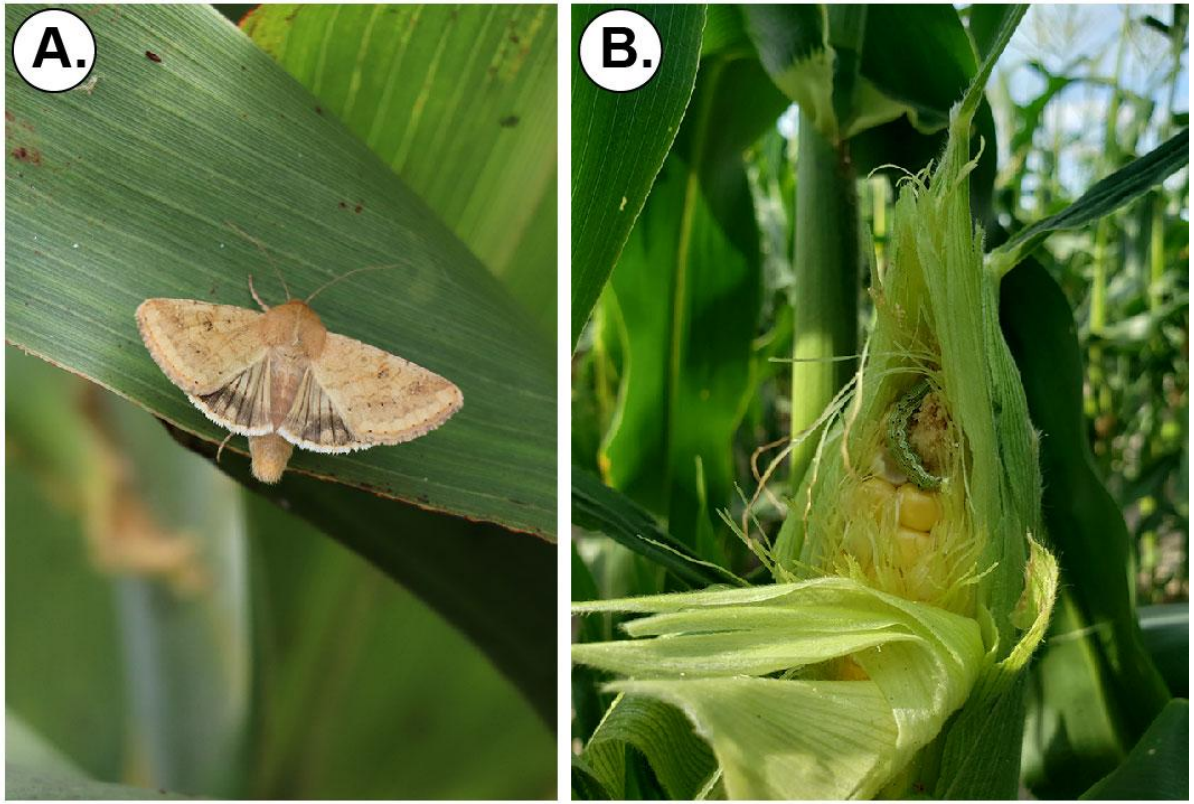


Benefit of sprays under low pressure?



Questions

- We observed limited benefit of Bt when sprayed intensively. Is that technology valuable to growers?
- Are current dynamic thresholds used?
- Should we adjust intervals for different insecticides corn?



Using Evaluation and Social Science to Boost Adoption of BMPs

Colby Silvert
Assistant Professor and Extension Specialist
University of Maryland
Agricultural and Extension Education
csilvert@umd.edu

CEWIPM.org

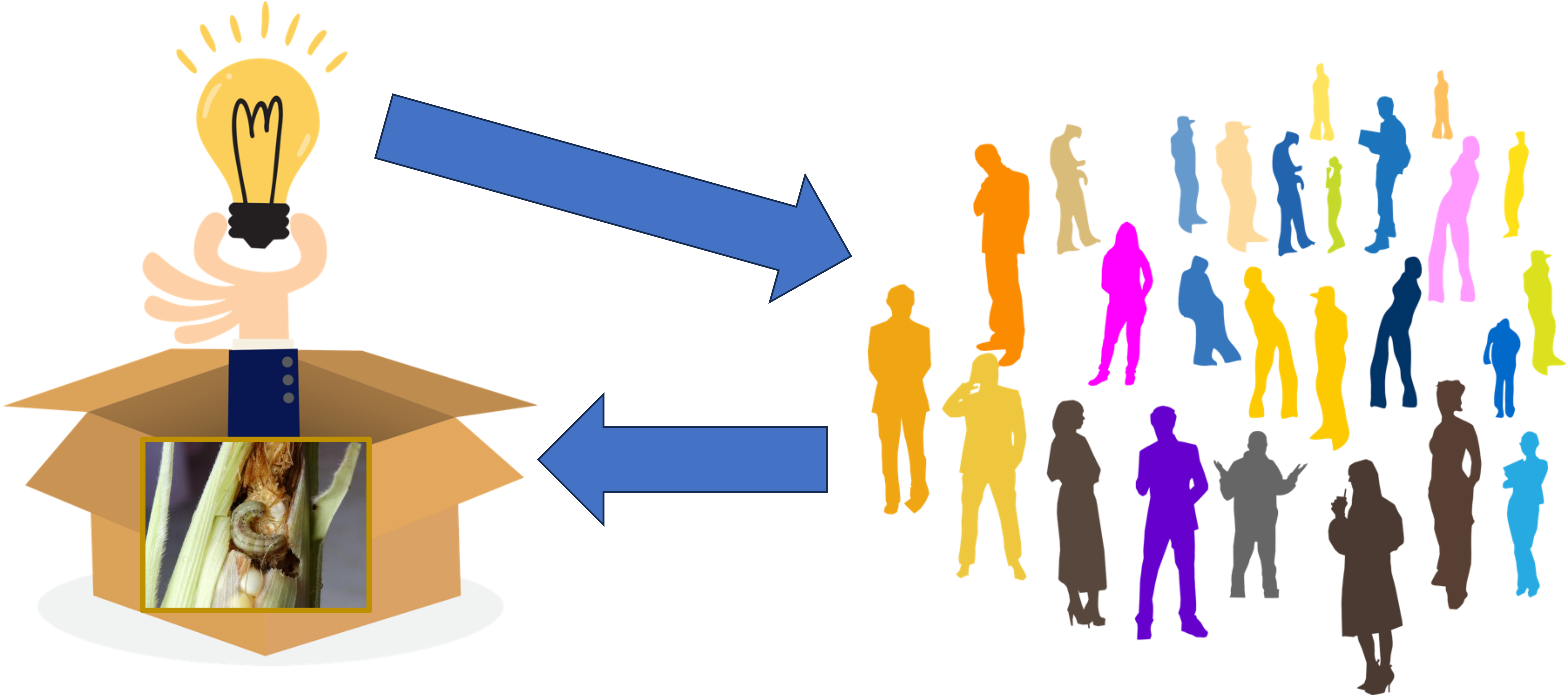
Midwest family farms to land-grant Extension

UNIVERSITY OF MARYLAND 1856

CGIAR
Science for a food-secure future

CEWIPM.org
Corn Earworm Integrated Pest Management

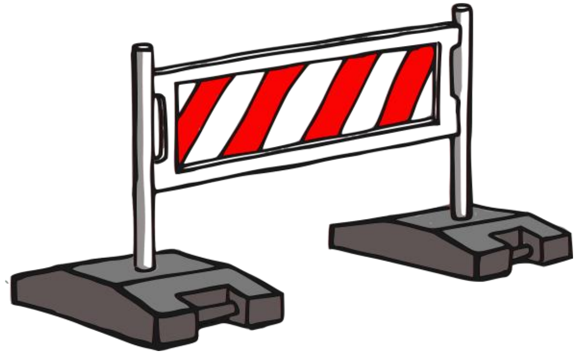
Specialist: Adoption of Best Practices + Evaluation



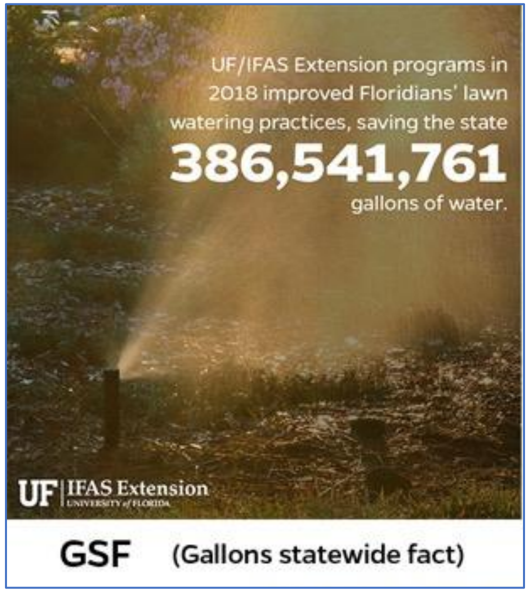
CEWIPM.org
Corn Earworm Integrated Pest Management

From Data to Targeted Programming to Adoption

Identify farmer innovators and influencers



Target barriers to behavior adoption



Strategic messaging and education

CEWIPM.org
Corn Earworm Integrated Pest Management

How? Using Social Marketing

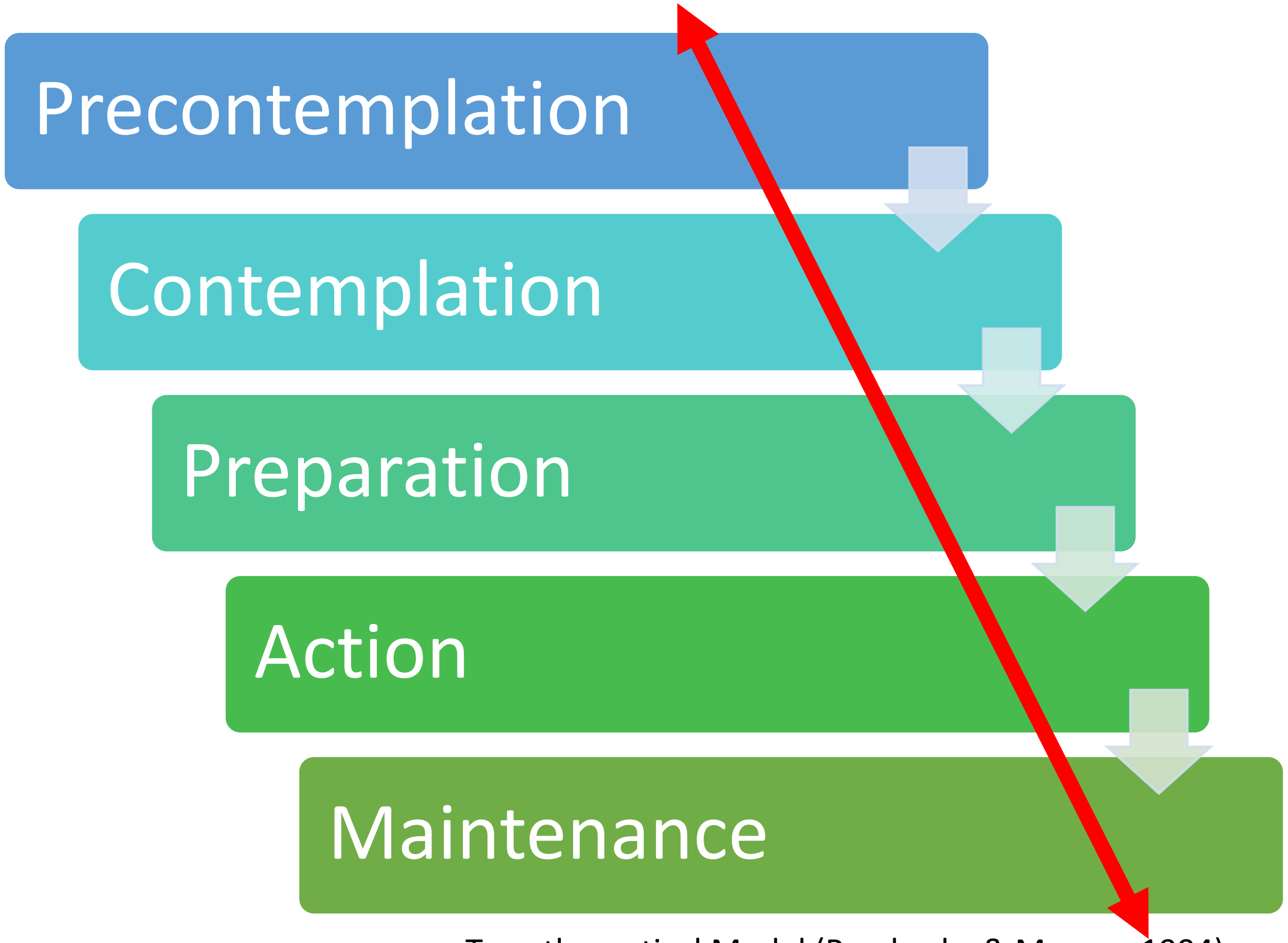
- Commercial marketing techniques for BMP adoption
- Target and segment your audience
- Target specific behaviors
- Reduce barriers and increase benefits in your promotion

Product	Price
Promotion	Place

CEWIPM.org
Corn Earworm Integrated Pest Management

How? Using Social Marketing

- Behavior change and BMP adoption is messy and not clearcut
- Identifying <u>where</u> someone is in the behavior change process can help!



Transtheoretical Model (Prochaska & Marcus, 1994)

CEWIPM.org
Corn Earworm Integrated Pest Management

How? Using Social Marketing

- Mapping the journey to BMP adoption using the TTM (Silvert & Warner, 2022)
- Visually mapping point A to point B in the behavior change journey (behavior change = adoption of smart irrigation here)
  - *Doing, thinking, feeling*
- Found that peer encouragement and modeling were critical to overcome barriers to behavior change (e.g., farmer-to-farmer learning)

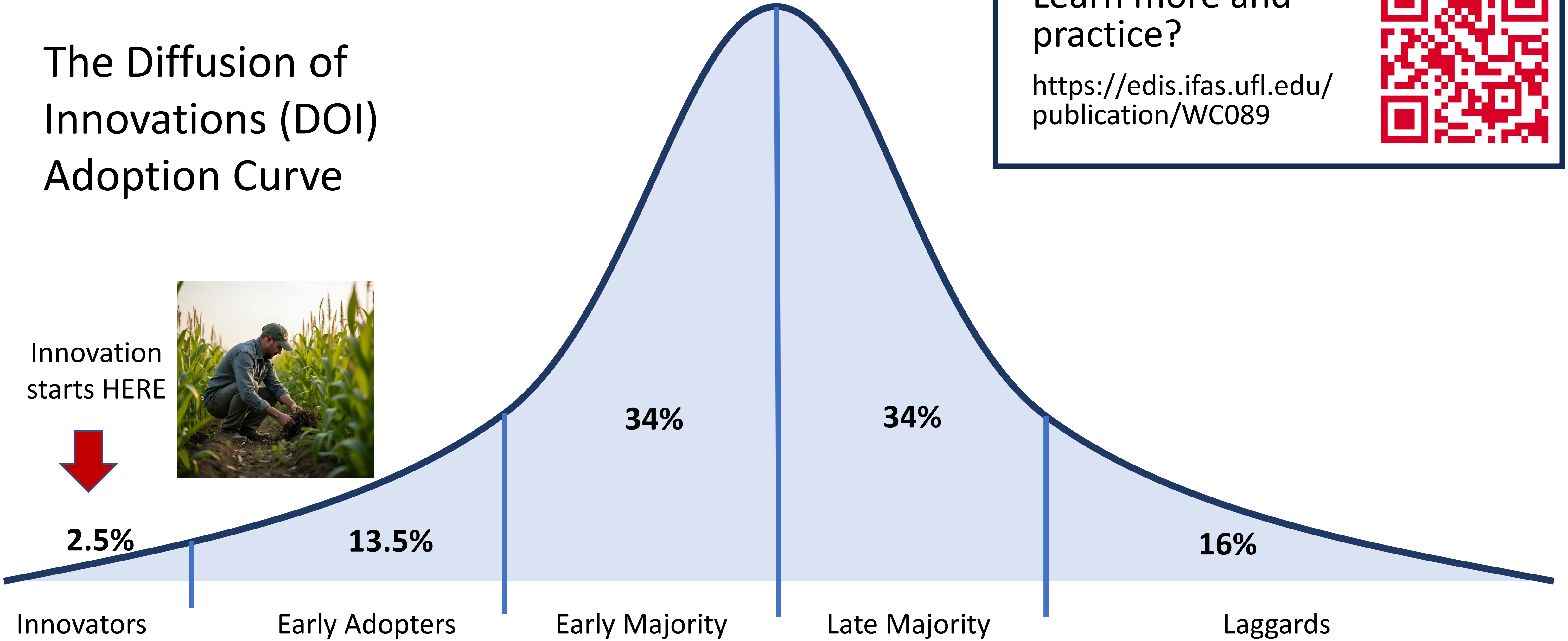
Learn more and practice?

https://edis.ifas.ufl.edu/publication/WC333

CEWIPM.org
Corn Earworm Integrated Pest Management

How? Using Diffusion of Innovations

The Diffusion of Innovations (DOI) Adoption Curve

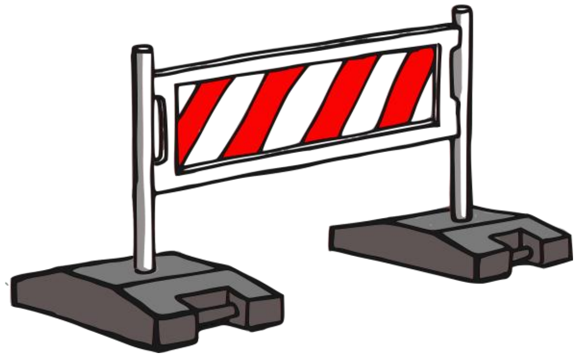


Learn more and practice?

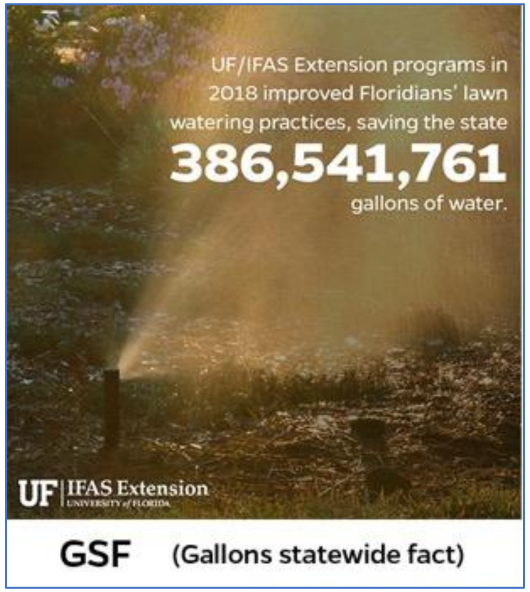
https://edis.ifas.ufl.edu/publication/WC089

Let’s discuss potential barriers to corn earworm management….

Identify farmer innovators and influencers



Target barriers to behavior adoption



Strategic messaging and education

CEWIPM.org
Corn Earworm Integrated Pest Management

Let’s discuss potential barriers to corn earworm management….

Thank you for taking the time to complete this survey. The purpose of this survey is to prioritize research and extension efforts for improving corn earworm management in sweetcorn throughout the Northeast. Results will be used in the development of a grant proposal for a project to address these needs.

This survey should only take 15-20 minutes or less to complete. This survey is open to sweet corn producers, crop consultants, Extension personnel and others who make sweet corn pest management decisions or provide management recommendations. Please review the Consent Form linked below. By answering the survey questions, you indicate that you are at least 18 years of age; you have read this consent form or have had it read to you; your questions have been answered to your satisfaction and you voluntarily agree to participate in this research study.

Your responses are confidential, and this survey does not contain questions that may personally identify you. Participation in this survey is voluntary and you may choose to skip questions you do not feel comfortable answering. This research has been approved by the University of Maryland Institutional Review Board (approval #1748662-1).

Consent Form

Which of the following best describes your relationship to sweet corn farming?

- ○ Farmer responsible for pest management decisions on the operation
- ○ Private crop consultant who provides recommendations for pest management decisions
- ○ Industry crop consultant who provides recommendations for pest management decisions
- ○ University Extension personnel who provides recommendations for pest management decisions
- ○ Custom applicator who applies pest management chemicals
- ○ Other (Please explain)

Example open-ended questions:

“Please explain why do you not use or recommend Bt hybrids to manage caterpillar pests”

“What other information could researchers provide to help better manage corn earworm?”

CEWIPM.org
Corn Earworm Integrated Pest Management

Full Room Discussion Questions

Based on the 2021 CEW management barriers and challenges handout…

- How — if at all — **have these barriers changed** since 2021? (e.g., improvement, worsening, relevance)
- Are there any **examples of solutions** the project should consider to tackle any of these barriers?
- If we were to **dig deeper for an updated assessment** of the CEW situation, what might be some of the most important issues to ask about?

CEWIPM.org
Corn Earworm Integrated Pest Management

Colby Silvert

Assistant Professor of Agricultural and Extension Education

Department of Plant Science & Landscape Architecture
2120 Plant Sciences Building
301-405-7041
csilvert@umd.edu

COLLEGE OF
AGRICULTURE &
NATURAL RESOURCES

CEWIPM.org

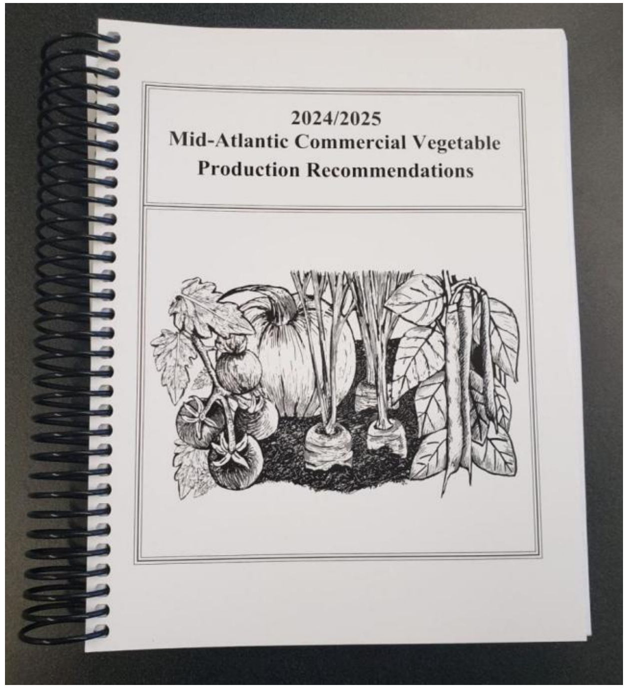
Project reflections and next steps

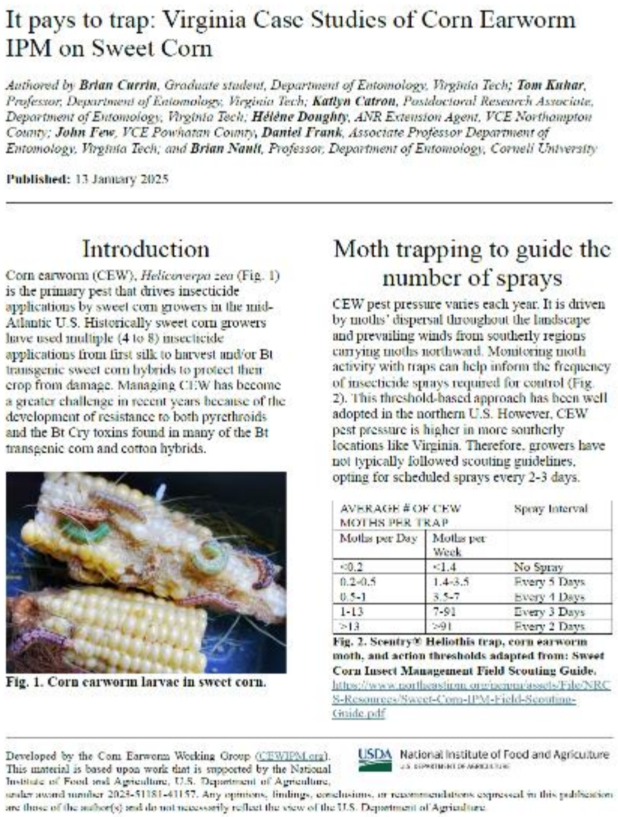
MyIPM for Vegetables

Kelly Hamby
Associate Professor and Extension Specialist
University of Maryland
kahamby@umd.edu

CEW IPM.org
Corn Earworm Integrated Pest Management

Developing useful resources





It pays to trap: Virginia Case Studies of Corn Earworm IPM on Sweet Corn

Authored by ***Brian Currin****, Graduate student, Department of Entomology, Virginia Tech;* ***Tom Kuhar****, Professor, Department of Entomology, Virginia Tech;* ***Katlyn Catron****, Postdoctoral Research Associate, Department of Entomology, Virginia Tech;* ***Hélène Doughty****, ANR Extension Agent, VCE Northampton County;* ***John Few****, VCE Powhatan County,* ***Daniel Frank****, Associate Professor Department of Entomology, Virginia Tech; and* ***Brian Nault****, Professor, Department of Entomology, Cornell University*

Published: 13 January 2025

Introduction

Corn earworm (CEW), *Helicoverpa zea* (Fig. 1) is the primary pest that drives insecticide applications by sweet corn growers in the mid-Atlantic U.S. Historically sweet corn growers have used multiple (4 to 8) insecticide applications from first silk to harvest and/or Bt transgenic sweet corn hybrids to protect their crop from damage. Managing CEW has become a greater challenge in recent years because of the development of resistance to both pyrethroids and the Bt Cry toxins found in many of the Bt transgenic corn and cotton hybrids.

Fig. 1. Corn earworm larvae in sweet corn.

Moth trapping to guide the number of sprays

CEW pest pressure varies each year. It is driven by moths' dispersal throughout the landscape and prevailing winds from southerly regions carrying moths northward. Monitoring moth activity with traps can help inform the frequency of insecticide sprays required for control (Fig. 2). This threshold-based approach has been well adopted in the northern U.S. However, CEW pest pressure is higher in more southerly locations like Virginia. Therefore, growers have not typically followed scouting guidelines, opting for scheduled sprays every 2-3 days.

AVERAGE # OF CEW MOTHS PER TRAP		Spray Interval
Moths per Day	Moths per Week	
<0.2	<1.4	No Spray
0.2-0.5	1.4-3.5	Every 5 Days
0.5-1	3.5-7	Every 4 Days
1-13	7-91	Every 3 Days
>13	>91	Every 2 Days

Fig. 2. Scentry® Heliothis trap, corn earworm moth, and action thresholds adapted from: Sweet Corn Insect Management Field Scouting Guide. https://www.northeastipm.org/neipm/assets/File/NRCS-Resources/Sweet-Corn-IPM-Field-Scouting-Guide.pdf

Developed by the Corn Earworm Working Group (CEWIPM.org). This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2023-51181-41157. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

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

MyIPM for Vegetables

CEWIPM.org
Corn Earworm Integrated Pest Management

2026/2027 production recommendations

Sweet Corn

Insect Control

THE LABEL IS THE LAW-see the Pesticide Use Disclaimer on the first page of Chapter F.

Insect pest management in sweet corn typically occurs in five separate phases:
1) preventive measures at the time of seed purchase such as selecting a Bt hybrid and/or pretreated with a commercially applied insecticide seed treatment; **2)** at-planting insecticide applications for soil pests; **3)** managing early seedling pests up to V6, **4)** managing whorl stage corn for lepidopteran pests; and **5)** ear protection.

1) Preventive Control

***Bt* Plant Incorporated Protectants in Sweet Corn**

All Bt sweet corn hybrids (see table below), regardless of whether single or pyramided traits, provide 100% protection against European corn borer, thus no insecticides are needed during the whorl or tasseling stages, or even during silking if this pest is the only concern. Although localized resistance concerns are emerging, Cry1Ab continues to control European corn borer in the Mid Atlantic. Corn earworm and fall armyworm are more tolerant to the Cry proteins. Attribute® II and Attribute® Plus hybrids (Syngenta Seeds) which contain the highly effective Vip3A protein currently provide nearly 100% control of fall armyworm and corn earworm. Bt hybrids will not control sap beetles, stink bugs, and silk feeding by corn rootworm adults which can reduce pollination. Because of this pest complex, insecticide sprays may be needed to ensure fresh market quality.

Trait Package and associated Bt proteins	Hybrid, Sugar gene[1], Color	Insects controlled	Herbicide Tolerance
Seminis Performance Series (Cry1A.105 + Cry2Ab2 + Cry3Bb1)	Anthem XR II, sh2, bicolor Devotion II, sh2, white Obsession II, sh2, bicolor Passion II, sh2, yellow Starfighter II, sh2, white SV9010SA, sh2, bicolor SV9012SD, sh2, yellow SV9014SB, syn, bicolor Temptation II, se, bicolor Tigershark II, sh2, bicolor	Common stalk borer Southern cornstalk borer European corn borer Fall armyworm Sugarcane borer Southwestern corn borer Northern corn rootworm larvae	Glyphosate (Roundup Ready, RR)
Syngenta Attribute I Series	BC0528, syn, bicolor	European corn borer	Glufosinate

Contributions from project team and beyond for a thorough revision

CEWIPM.org
Corn Earworm Integrated Pest Management

CEWIPM.org

CEWIPM.org
Corn Earworm Integrated Pest Management

About Us | Project News | Resources | Publications | Webinars

Search...

Resources

Online Resources

Using Pheromone Baited Traps To Monitor Corn Earworm in Sweet Corn

by John Mahas and Brian Nault, Cornell Entomology

It Pays To Trap: Virginia Case Studies of Corn Earworm IPM on Sweet Corn

Published: 13 January 2025

CEWIPM.org
Corn Earworm Integrated Pest Management

CEWIPM.org

CEWIPM.org
Corn Earworm Integrated Pest Management

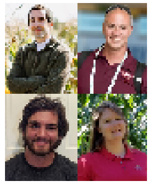
About Us | Project News | Resources | Publications | Webinars

Search...

Webinars

Management Options for Corn Earworm in Sweet Corn

Join us February 19 at 2 p.m. for two talks—the first focused on using Bt hybrids and the second on using insecticides during silking for management. Presenters include Veronica Yurchak and Kelly Hamby.



Corn Earworm Integrated Pest Management Updates for Sweet Corn

Recorded February 11, 2025 – Presenters: John Mahas, Tom Kuhar, Brian Currin, Kelly Hamby. This webinar includes two update talks. The first discusses effectively using baited traps for monitoring adult moths and the second discusses the benefits of using these traps for managing corn earworm in a Virginia case study.

Developed and managed by the Northeastern IPM Center. This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2023-51181-41157. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

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

Upcoming Webinar

Register here:

Management Options for Corn Earworm in Sweet Corn

Join us February 19 at 2 p.m. for two talks—the first focused on using Bt hybrids and the se

Presenters include Veronica Yurchak and Kelly Hamby.

Thursday, February 19, 2026
2:00-3:30PM

Bt Sweet Corn Hybrids: Efficacy, Pest Pressure, and Regional Monitoring Results – Veronica Yurchak and Galen Dively

Efficacy, Timing, and Safety Considerations for Silk Spray Insecticides – Kelly Hamby, Jared Dyer, Dan Gilrein, David Owens, John Mahas, Brian Nault, Brian Currin, Tom Kuhar, and Kemper Sutton

CEWIPM.org
Corn Earworm Integrated Pest Management

Sweet corn IPM working group

23 in person, 6 zoom
entomologists, pathologists, weed scientists, ecologists, horticulturists, IPM folks, extension folks from FL to ME

Northeastern IPM Center

Sweet corn IPM working group

23 in person, 6 zoom
entomologists, pathologists, weed scientists, ecologists, horticulturists, IPM folks, extension folks from FL to ME

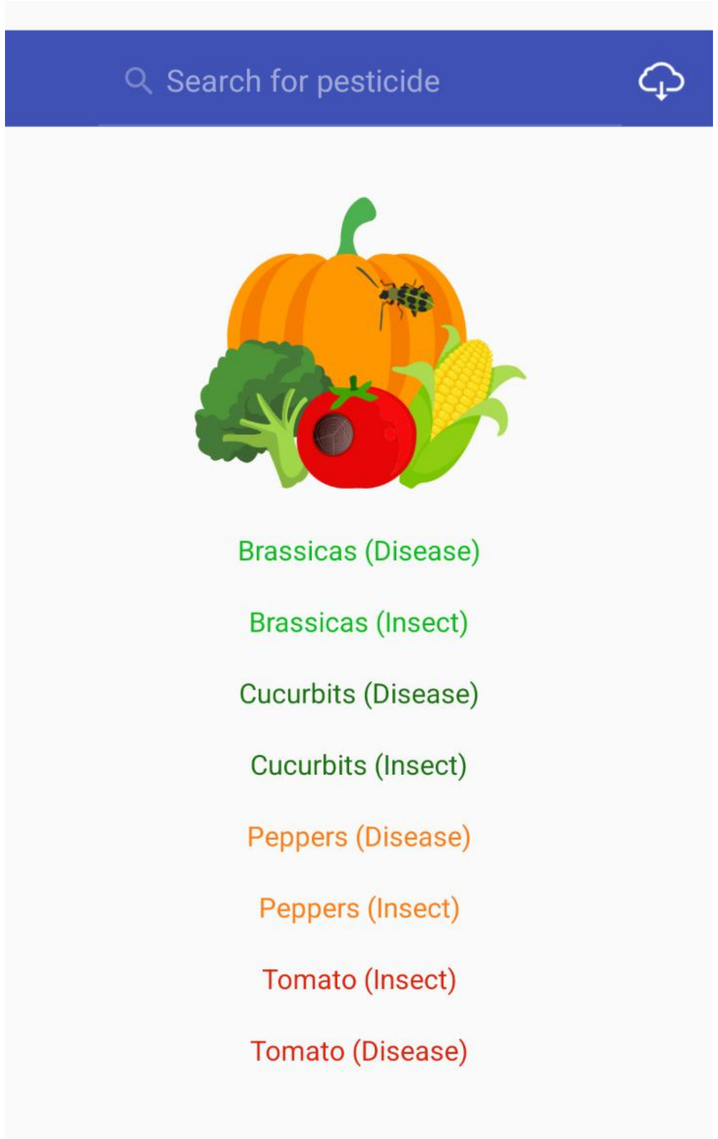
Northeastern IPM Center

Sweet corn IPM working group

- Research and extension priority setting
- Built network for new collaborations
- Shared resources
- Discussed MyIPM App

Northeastern IPM Center

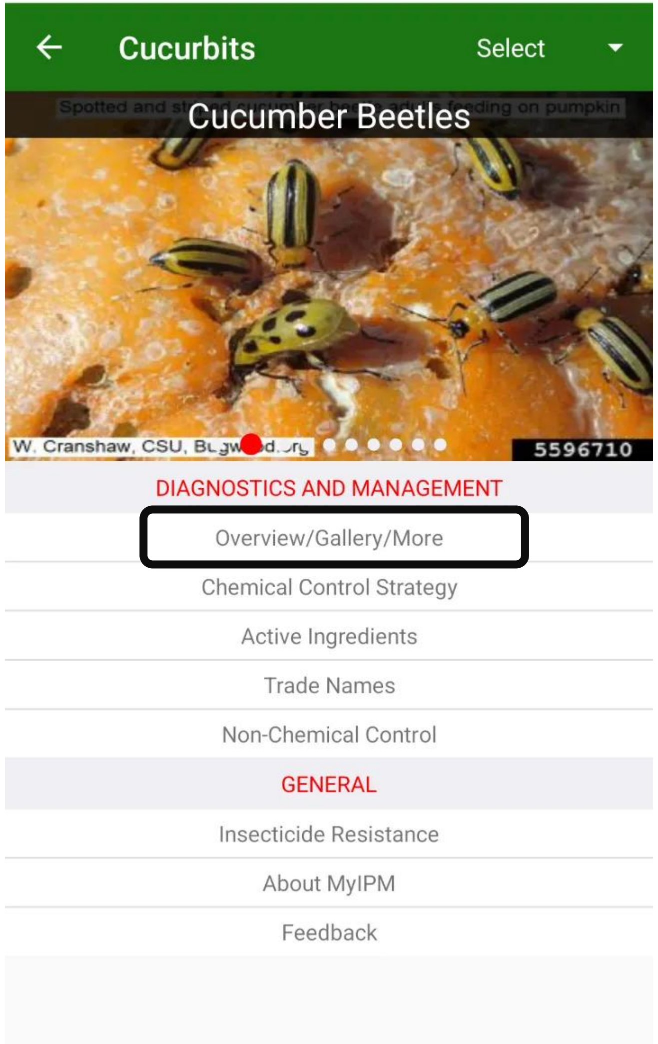
Vegetable MyIPM App

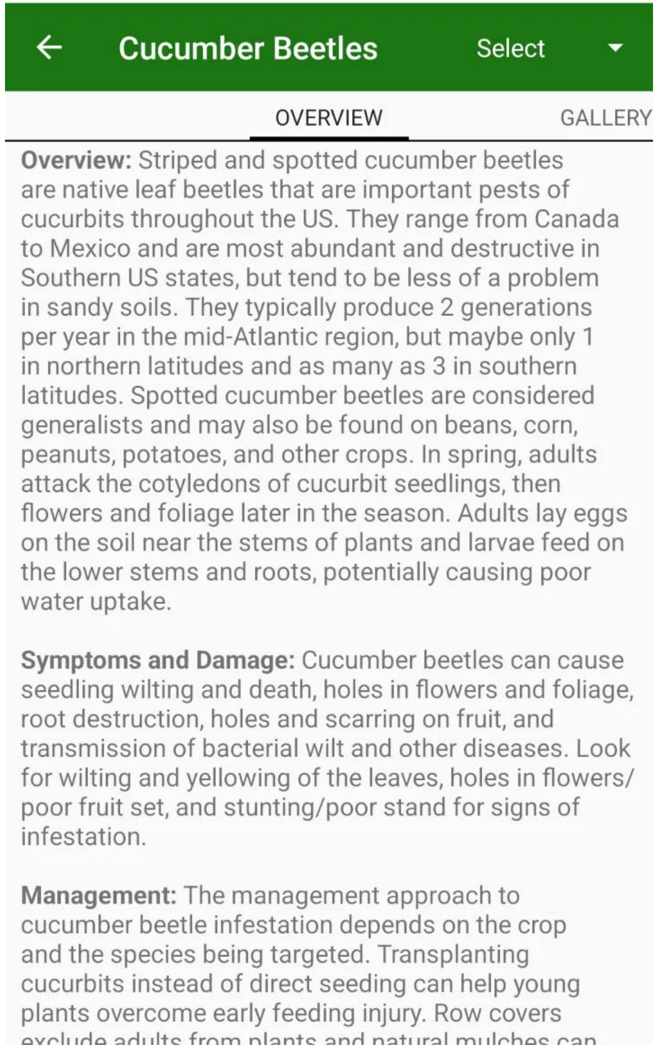


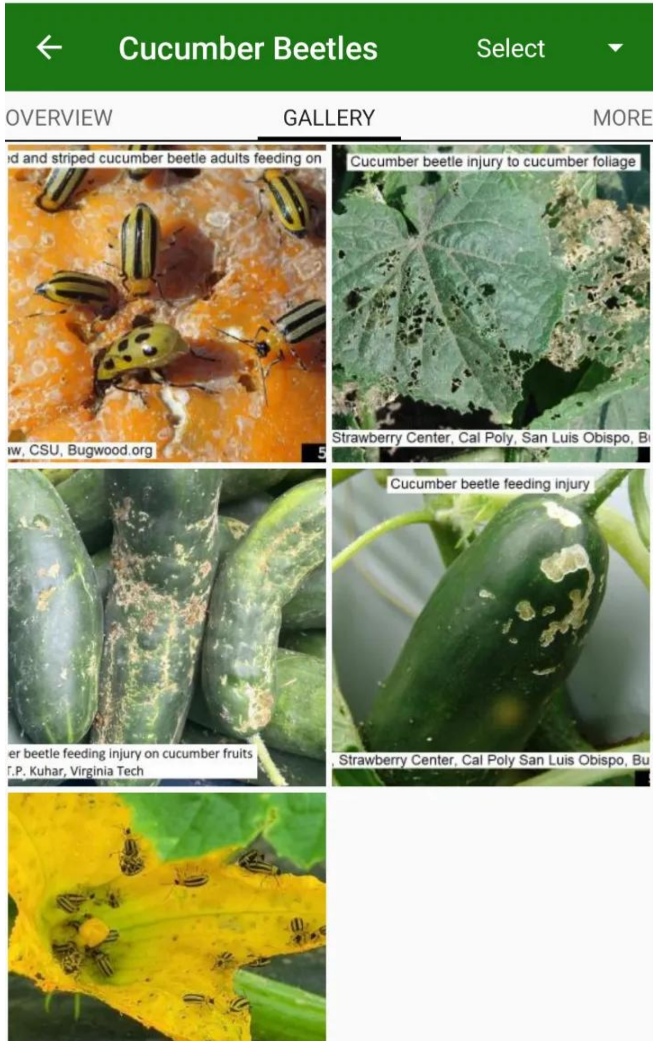
https://myipm.app/

Southern IPM Center

Vegetable MyIPM App







Southern IPM Center

Vegetable MyIPM App

Cucurbits — Select

Cucumber Beetles

DIAGNOSTICS AND MANAGEMENT

- Overview/Gallery/More
- Chemical Control Strategy
- Active Ingredients
- Trade Names
- Non-Chemical Control

GENERAL

- Insecticide Resistance
- About MyIPM
- Feedback

Cucumber Beetles — Select

CONVENTIONAL | ORGANIC

Trade Name	IRAC Code	Efficacy
Admire Pro (Soil)	4A	++++
Asana XL	3A	+++
Assail 30SG	4A	+++++
Belay (Foliar)	4A	+++
Belay (Soil)	4A	+++
Brigade 2EC	3A	++++
Scorpion 35SL (Foliar)	4A	+++
Scorpion 35SL (Soil)	4A	+++
Sevin XLR Plus	1A	?
Venom 70 SG (Foliar)	4A	+++
Warrior II	3A	++++

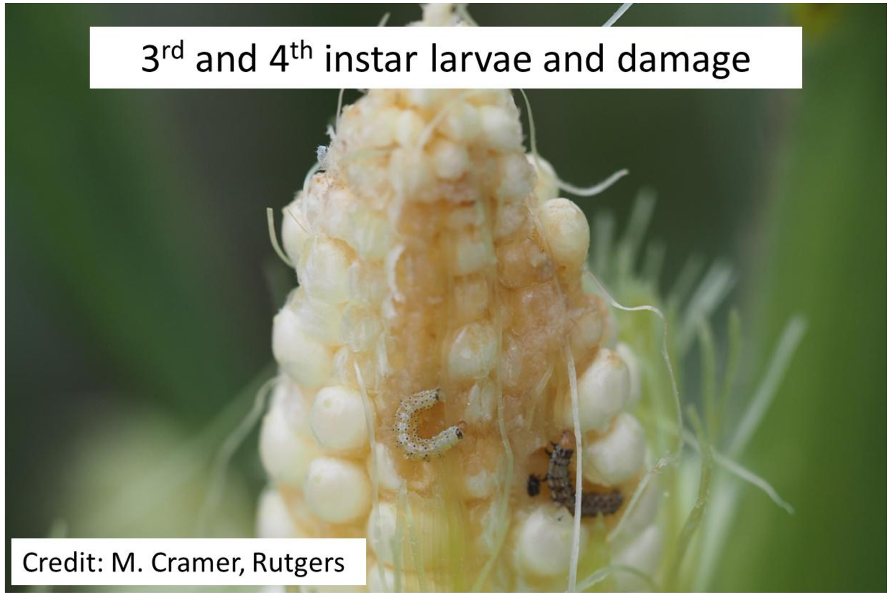
Cucumber Beetles — Select

CONVENTIONAL | ORGANIC

Trade Name	REI/hrs	Max Spray
Admire Pro (Soil)	12	1
Asana XL	12	8
Assail 30SG	12	5
Belay (Foliar)	12	See label
Belay (Soil)	12	See label
Brigade 2EC	12	3
Scorpion 35SL (Foliar)	12	10
Scorpion 35SL (Soil)	12	2
Sevin XLR Plus	12	6
Venom 70 SG (Foliar)	12	6
Warrior II	24	8

Southern IPM Center

Sweet Corn (Insect) MyIPM



SWEET CORN INSECT
Corn Earworm
Arthur Young, University of Maryland, Shea Ill, University of Maryland, Kelly Hamby, University of Maryland, and Simon Zebelo, University of Maryland Eastern Shore
Chemicals

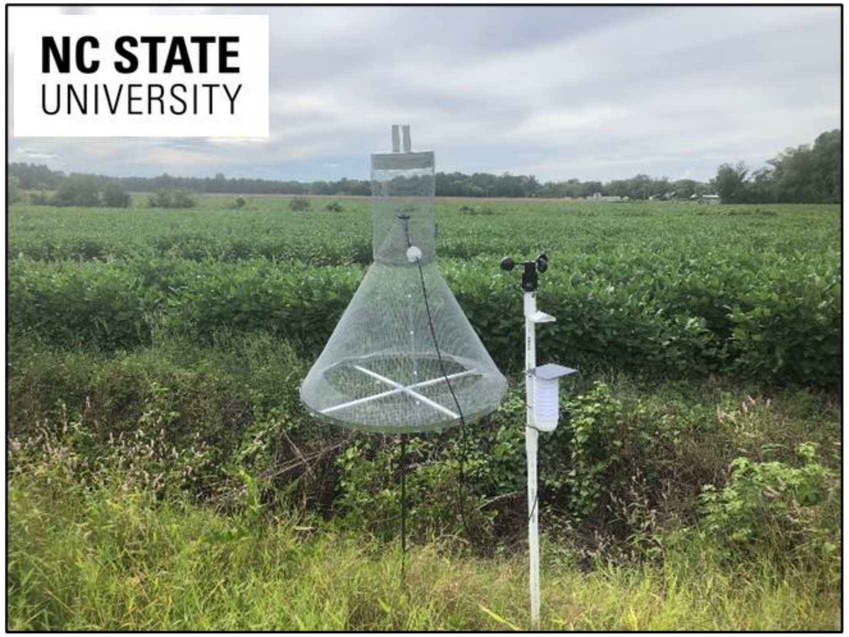
Active Ingredient	FRAC or IRAC Code	Type	Resistance Risk	Trade Name	PHI (days)	REI (hours)	Rate	Max # Sprays	Max Product	Efficacy
Methomyl	1A	CON	?	Lannate LV 2.4WSL	See label	48	0.75 – 1.5 pints/acre	See label	21 pints	+++
Spinosad	5	CON	?	Blackhawk3 6WG	See label	4	2.2-3.3 oz/acre	6 per calendar year	20 oz/acre/yea r	+++
Spinetoram	5	CON	?	Radiant 1SC, hemi	1 day ear harvest 3 days fodder or forage	4	3-6 oz/acre	6 per calendar year	36 oz/acre/yea r	+++++
Chlorantran iliprole	28	CON	?	Coragen	1 day	4	3.5-7.5 oz/acre	4 per year	15.4 oz/acre/yea r	+++
Chlorantran iliprole	28	CON	?	Coragen Evo 5SC	1 day	4	1.2-1.5 oz/acre	4 per year	5.1oz	+++
Chlorantran	28	CON	?	Vantacor	1 day	4	1.2-2.5	4 per year	5.1oz	+++

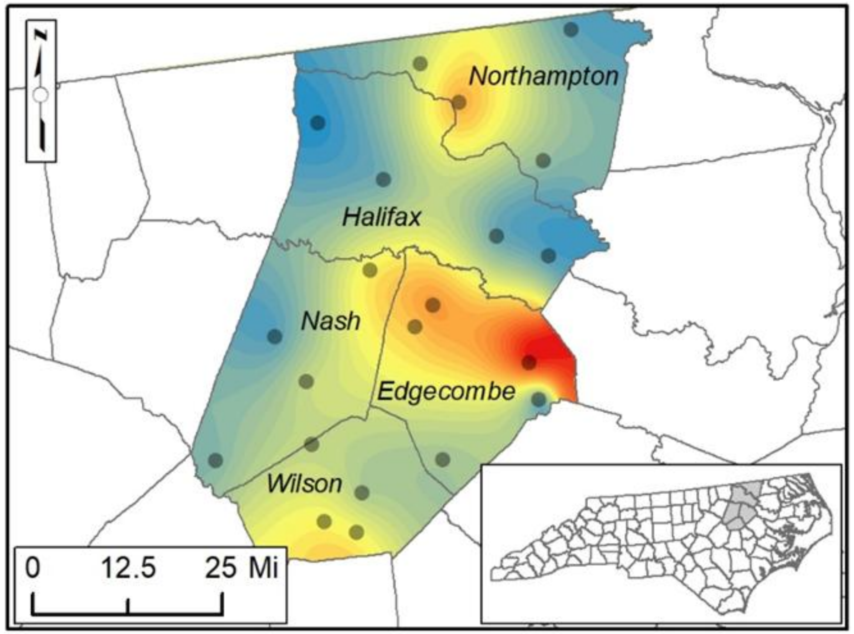
In progress

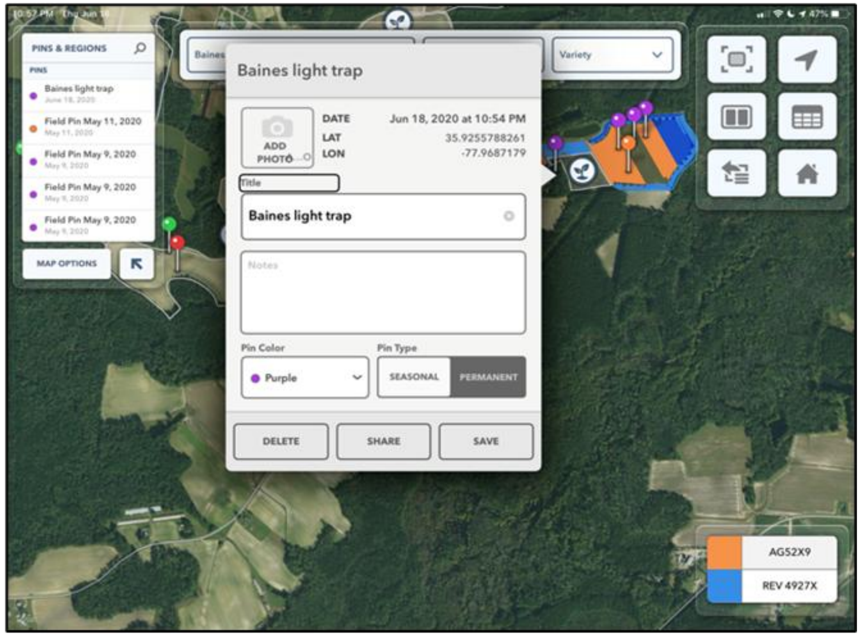
CEWIPM.org
Corn Earworm Integrated Pest Management

Mapping and forecasting

Traps & data uplinks → Analysis → Tools for farmers







In progress

CEWIPM.org
Corn Earworm Integrated Pest Management

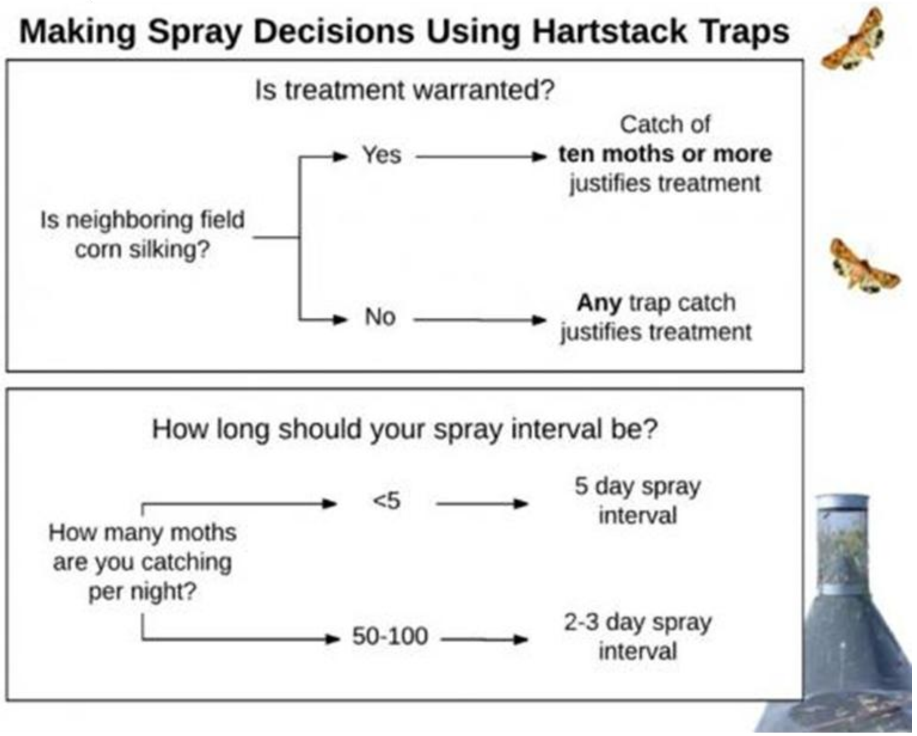
Other potential resources

Video tutorials on using pheromone traps to monitor corn ear worm in sweet corn

March 7, 2017 - Benjamin Werling and Marissa Schuh

Share Tweet Save Share Print Email

Watch this video for information on how to assemble and place traps.



Educational videos, fact sheets, infographics, etc.

CEWIPM.org
Corn Earworm Integrated Pest Management

Project timeline

Project starts
Sep 2023

Extend funds?
New project?

2023 → 2024 → 2025 → 2026 → 2027 → 2028

Project ends
Aug 2027

Next (last?) meeting virtually in Winter 2027

CEWIPM.org
Corn Earworm Integrated Pest Management

Next steps

Some studies complete, some ongoing

CEWIPM.org
Corn Earworm Integrated Pest Management

New study planned

VA Eastern Shore AREC – Kemper Sutton

CEWIPM.org
Corn Earworm Integrated Pest Management

Compare application methods

Comparing insecticide efficacy against corn earworm using different application methods

Field plot study for 2026 at the ESAREC:

1. Backpack sprayer
2. Drone
3. Spider Sprayer
4. Blower

Evaluating: Time, coverage, cost, and control

CEWIPM.org
Corn Earworm Integrated Pest Management

Potential new study

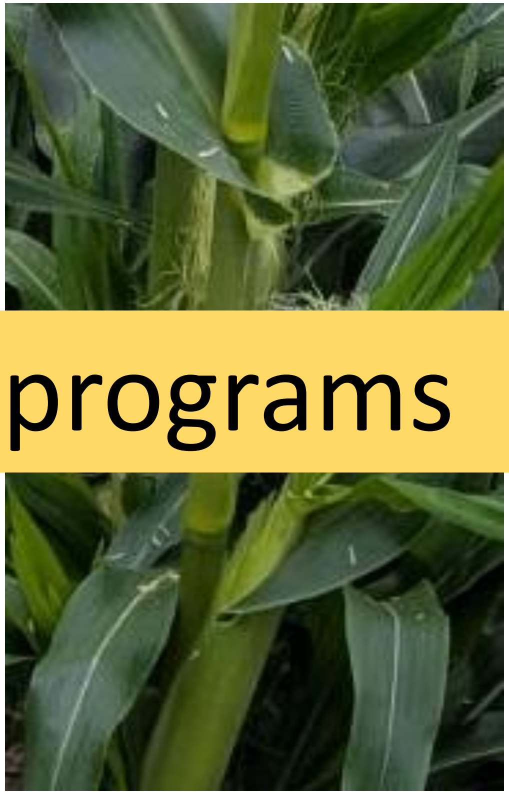
Pre-tasseling

Tassel visible in whorl or above

Tasseling

Last branch above flag leaf

Green Silk

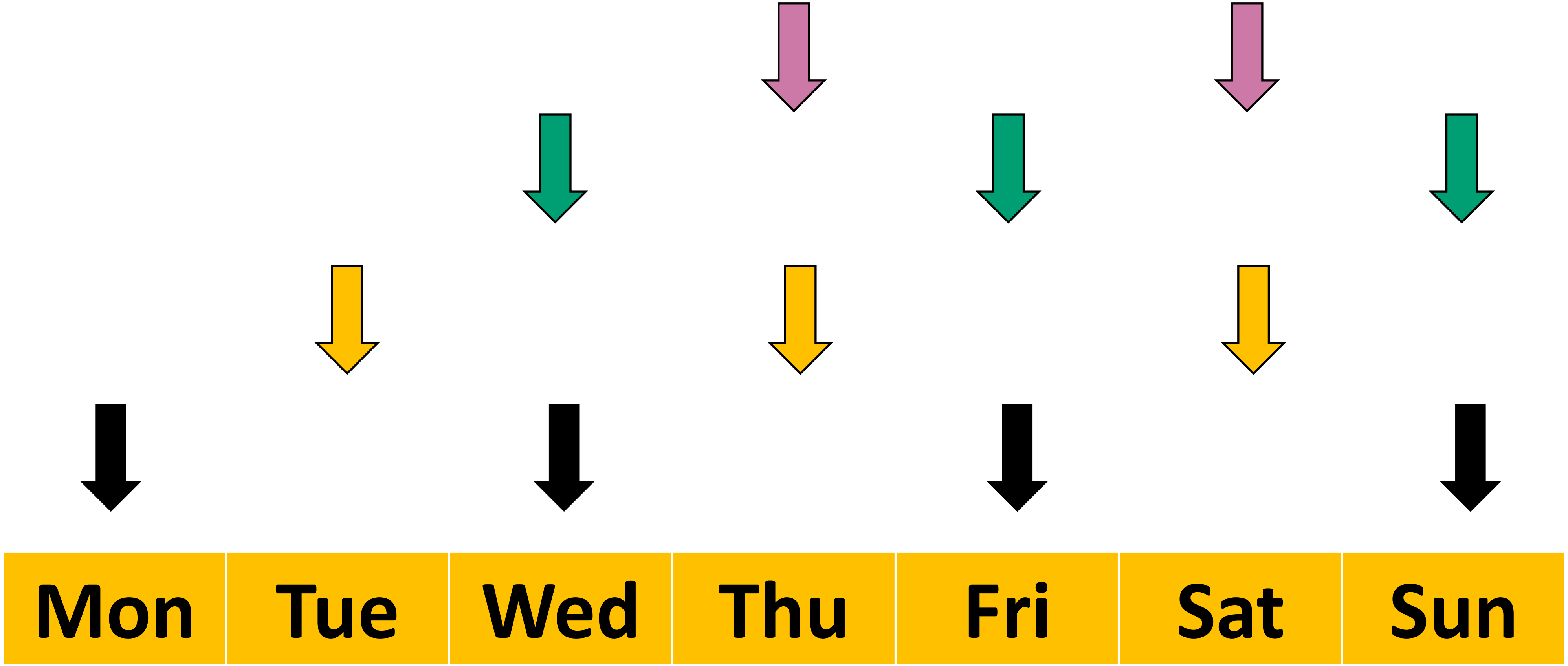


Even 1 strand of silk visible

Compare timings for starting spray programs

CEWIPM.org
Corn Earworm Integrated Pest Management

Compare timings for starting programs



“Early tassel” occurs on Monday

Potential new study

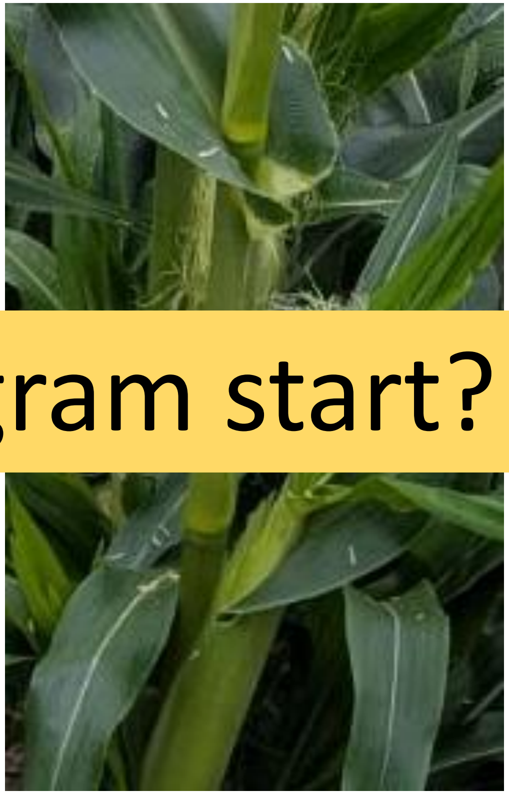
Pre-tasseling

Tassel visible in whorl or above

Tasseling

Last branch above flag leaf

Green Silk



Even 1 strand of silk visible

Of interest? What stage should program start?

CEWIPM.org
Corn Earworm Integrated Pest Management

Potential new study

Lacewing larvae:

$30.50 per 1,000

$115.00 per 5,000

$205.00 per 10,000

Minute pirate bugs:

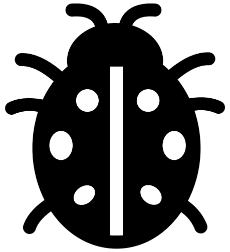
$53.00 per 500

$88.00 per 1,000

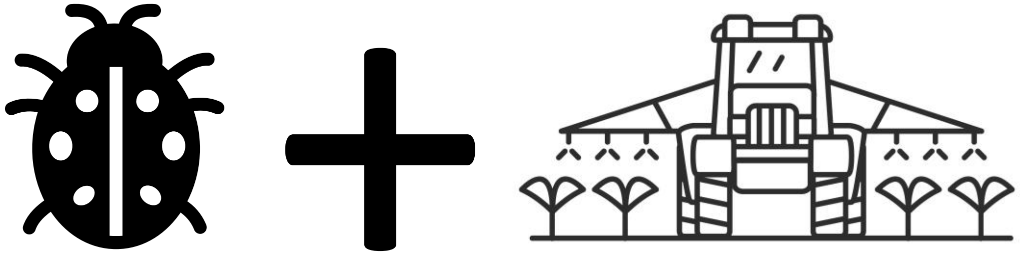
$154.00 per 2,000

CEWIPM.org Corn Earworm Integrated Pest Management

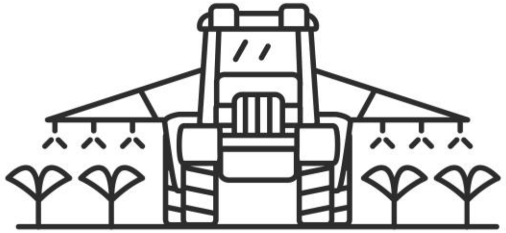
Predator release efficacy



Predator release(s) alone



Predator release(s) + reduced risk silk spray program



Reduced risk silk spray program alone

CEWIPM.org
Corn Earworm Integrated Pest Management

Which predator? Of interest?

Photo: J. Obermeyer

Lacewing larvae:
$30.50 per 1,000
$115.00 per 5,000
$205.00 per 10,000

Photo: Texas A&M

Minute pirate bugs:
$53.00 per 500
$88.00 per 1,000
$154.00 per 2,000

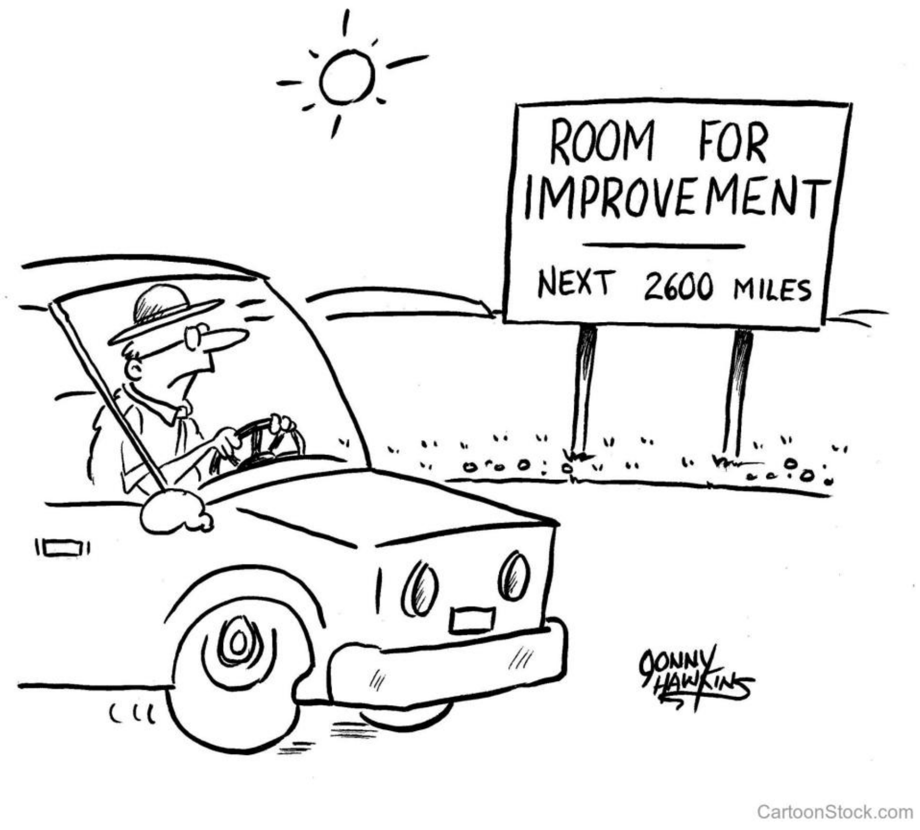
CEWIPM.org
Corn Earworm Integrated Pest Management

Other ideas

Average CEW moths per night	Spray interval
<0.2	No spray
0.2-0.5	Every 5 days
0.5-1	Every 4 days
1-13	Every 3 days
>13	Every 2 days

- Threshold experiment
- Compare spray programs for costs and risk to natural enemies
- Compare different timings for last spray prior to harvest

Discussion



1. What data or information do you need to improve your ability to manage corn earworm?
2. Do you have ideas for future research questions or experiments that we should consider? Which potential experiment would you prioritize?
3. What about this project has been most helpful to you and/or your clientele? How could this project improve?

CEWIPM.org
Corn Earworm Integrated Pest Management

Corn earworm (*Helicoverpa zea*) life history FAQs

Kelly A. Hamby, Department of Entomology, University of Maryland College Park, kahamby@umd.edu

Life cycle in corn

Photo: D. Owens

500-3,000 eggs laid individually[9]

Photo: M. Cramer

5-6 larval instars[9]

Photo: B. Molake

Pupate 0-10" deep[14]

Photo: D. Owens

4-38 day adult lifespan[9]

Q: How long does it take for tip damage to occur?

Time from when egg is laid until the larva reaches the tip of the ear

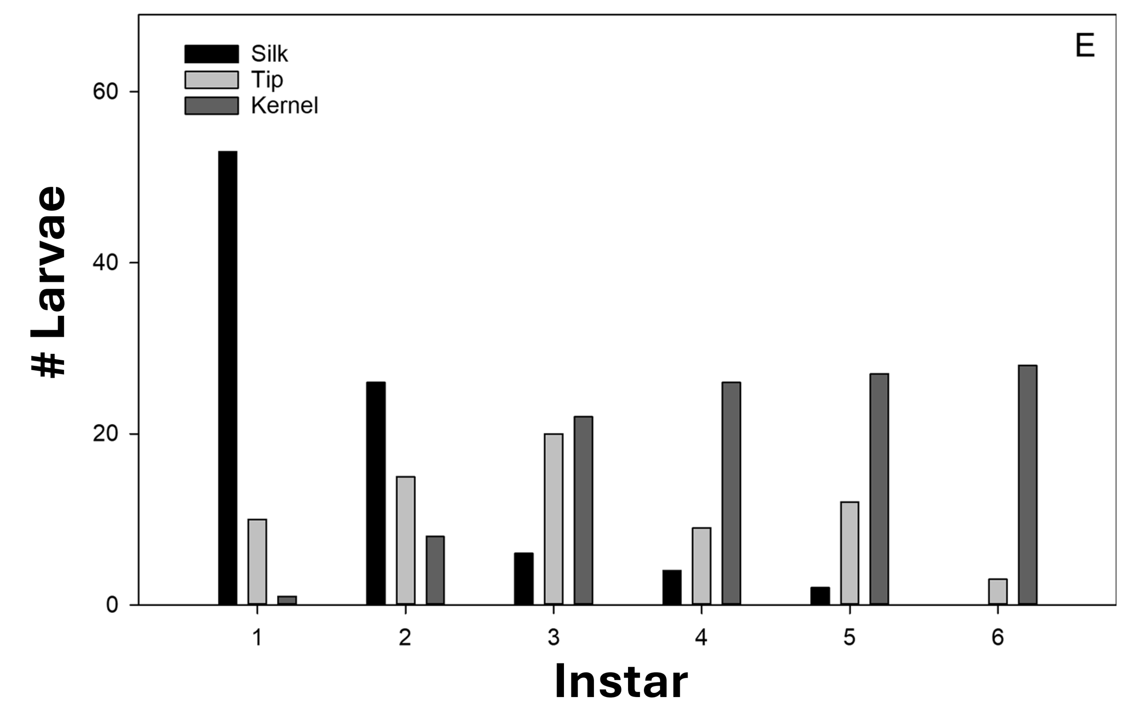


Figure 2. Sum of larvae collected across all Bt and non-Bt [field] corn hybrids in silk, tip, or kernel tissue by instar (stage) in 2017 (Fig. 5E)[8]

Table 1. Time to egg hatch at constant lab temperature

°F	Average Days
60	12.6[7]
66	6.3[7]
70	4.6[6]
75	3.6[6]
80	2.9[6]
85	2.5[6]
90	2.2[6]
95	2.4[6]
100	All died[6]

- Eggs and 1st instar larvae each take 2.0 days minimum to develop
- 1st instar larvae rapidly move into tight bundles of silk[9]
- Reach silks at tip of ear in 30 minutes to 2.5 hrs[9]
- Likelihood of kernel feeding increases with age of larva (**Fig. 2**)[8]

A: At least 2 days, more likely 3-4 days

Q: Would killing adult moths reduce infestation?

Moths are highly mobile strong fliers[1,2]

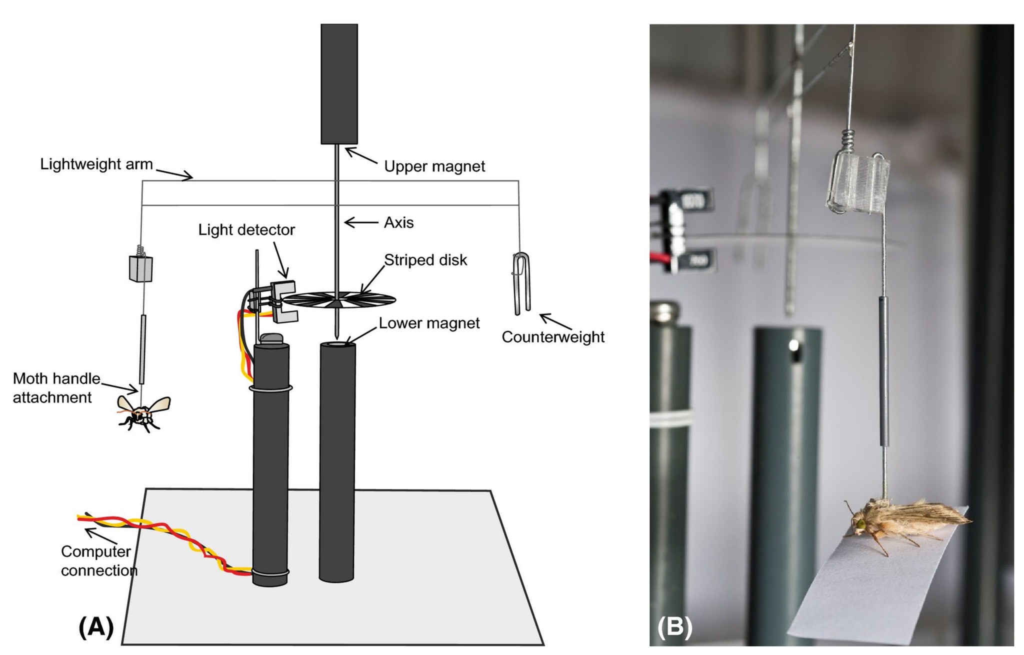


Figure 1. Tethered flight mill. (A) Labeled diagram of flight mill. (B) Close up of attached moth. Flight mills are patented.[3]

Distance traveled

- 248 mi per night migratory flight detected by radar[1]
- Fly 28.9 ft up to 23.7 mi[2] on a flight mill[3] (**Fig. 1**)
- 32% migratory (>6.2 mi) , 36% long (0.62 - 6.2 mi), and 32% short (<0.62 mi) distance moth flights[2]

Arrive ready to lay eggs

- Mating status and number of mature eggs does not impact the distance that female moths fly[2]

Over 300 crop and non-crop hosts support development and build moth populations in the landscape[4,5]

A: Very unlikely to pay off

Q: How long do ears need to be protected?

Eggs laid on or near silks most likely to infest ears[10]

Eggs laid before silking or on other plant parts also cause ear damage[9,10]

Table 2. Approximate percent corn earworm eggs per corn plant part

Corn Part	% Eggs	
Tassel	7-9[9]	<1[11]
Stalk	7-16[9]	–
Husk or sheath	2-3[9]	14[11]
Silk	31-71[9]	>80[11]
Upper leaf surface	10-33[9]	4[11]
Lower leaf surface	0-9[9]	0[11]

Figure 3. Corn earworm egg laid on dry silk (inside white circle). Photo: D. Owens

Eggs typically laid on fresh silks but may be laid on brown silks through late dough stage[12] (**Fig. 3**)

Takes time for tip damage to occur, can terminate spray program up to 5 days before last harvest

A: First silks until 5 days to last harvest

References: [1]Wolf et al. 1990 *Philos Trans R Soc Lond B Biol Sci*, [2]Calixto et al. 2024 *Ann Entomol Soc Am*, [3]Jones et al. 2015 *Ecol Evol*, [4]Glover et al. 2023 *Fla Entomol*, [5]Barber 1937 *J Econ Entomol*, [6]Eubank et al. 1973 *Environ Entomol*, [7]Luckman 1963 *J Econ Entomol*, [8]Bilbo et al. 2019 *PloS One*, [9]Ditman and Cory 1931 *UMD Ag Exp Sta*, [10]Gross 1986 *J Entomol Sci*, [11]Nishida and Napompeth 1974 *Proc Hawaii Entomol Soc*, [12]Archer and Bynum 1994 *Environ Entomol*, [13]Olmstead et al. 2016 *J Econ Entomol*, [14]Ditman and Cory 1933 *UMD Ag Exp Sta*

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

This work is supported by the Specialty Crop Research Initiative program [grant no. 2023-51181-41157/project accession no. 1031455], from the U.S. Department of Agriculture's National Institute of Food and Agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and should not be construed to represent any official USDA or U.S. Government determination or policy.

CEWIPM.org
Corn Earworm Integrated Pest Management

Forty -Year Corn Earworm Capture Analysis Reveals Shifts in Phenology and its Association with Rising Temperatures

Bukola Molake, Micheal Crossley
Entomology and Wildlife Conservation Department, University of Delaware

Background

Climate change influences the behavior and life cycle of insect species. Agricultural entomologists and farmers are increasingly concerned about the effects that rapid environmental changes have on crop and livestock pests. In this study, we analyze over 40 years of trap-capture data for a common specialty crop pest, the corn earworm, to investigate how phenology has changed across North America and how it relates to rising temperatures.

Questions

How has early and late- season CEW activity across sites in North America shifted over time?

Do shifts in early and late activity times vary between the northern and southern US across time?

Are shifts in phenology related to warming winter and/or increasing growing season temperatures?

Are shifts in phenology consistent across trap types (blacklight, pheromone, combination)?

Methods

Data Acquisition and sorting

- Used the Lawton et al (2022) data set of CEW capture counts from 1981 to 2021.
- Split Into North and Southern Sites identified via 40° latitude

Describing Phenology

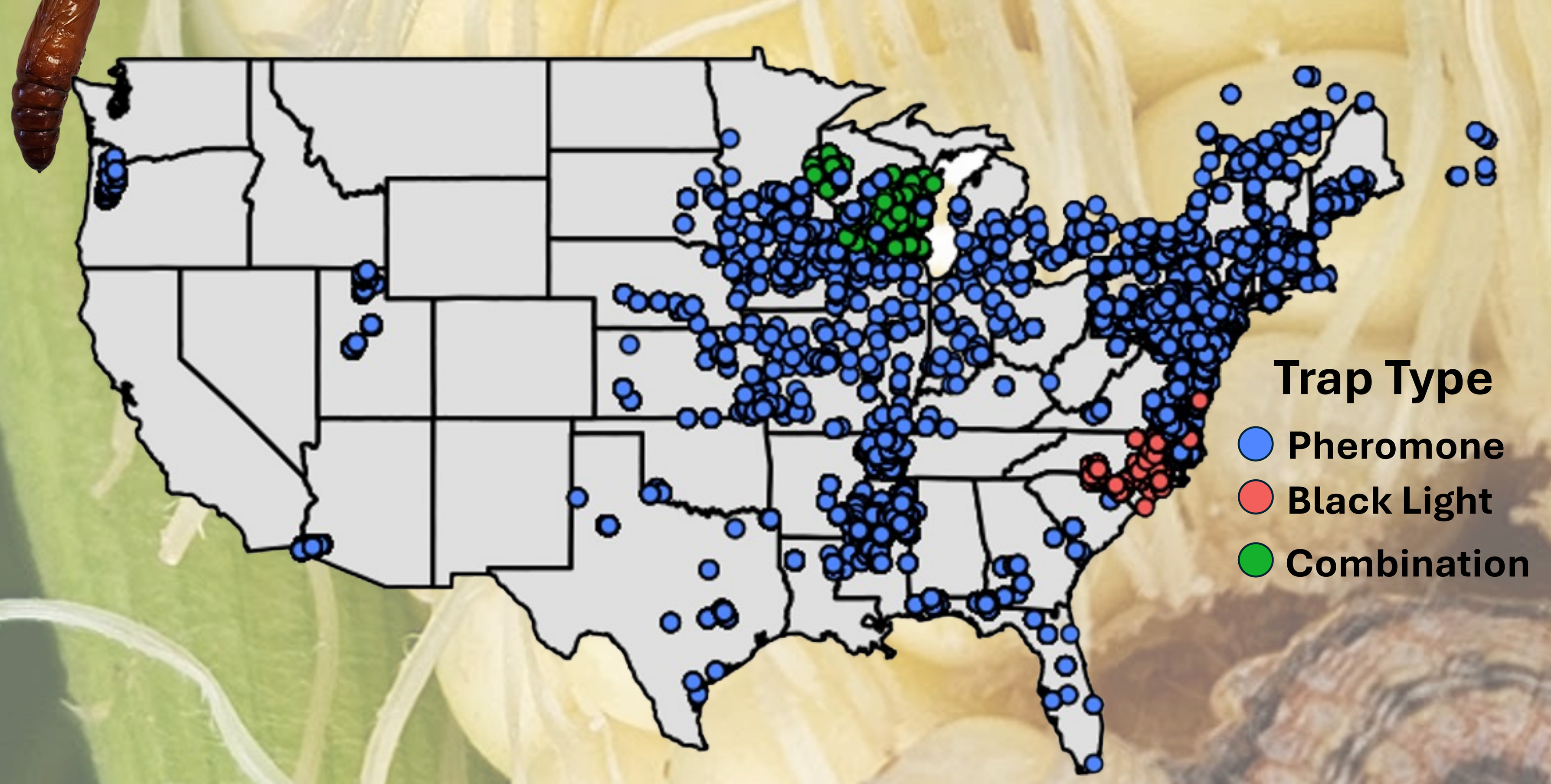
- Yearly cumulative proportion of weekly CEW captures estimated per site
- Used a logistic regression model to estimate the week of year (WOY) when 10% and 90% of CEW were captured across sites per year.

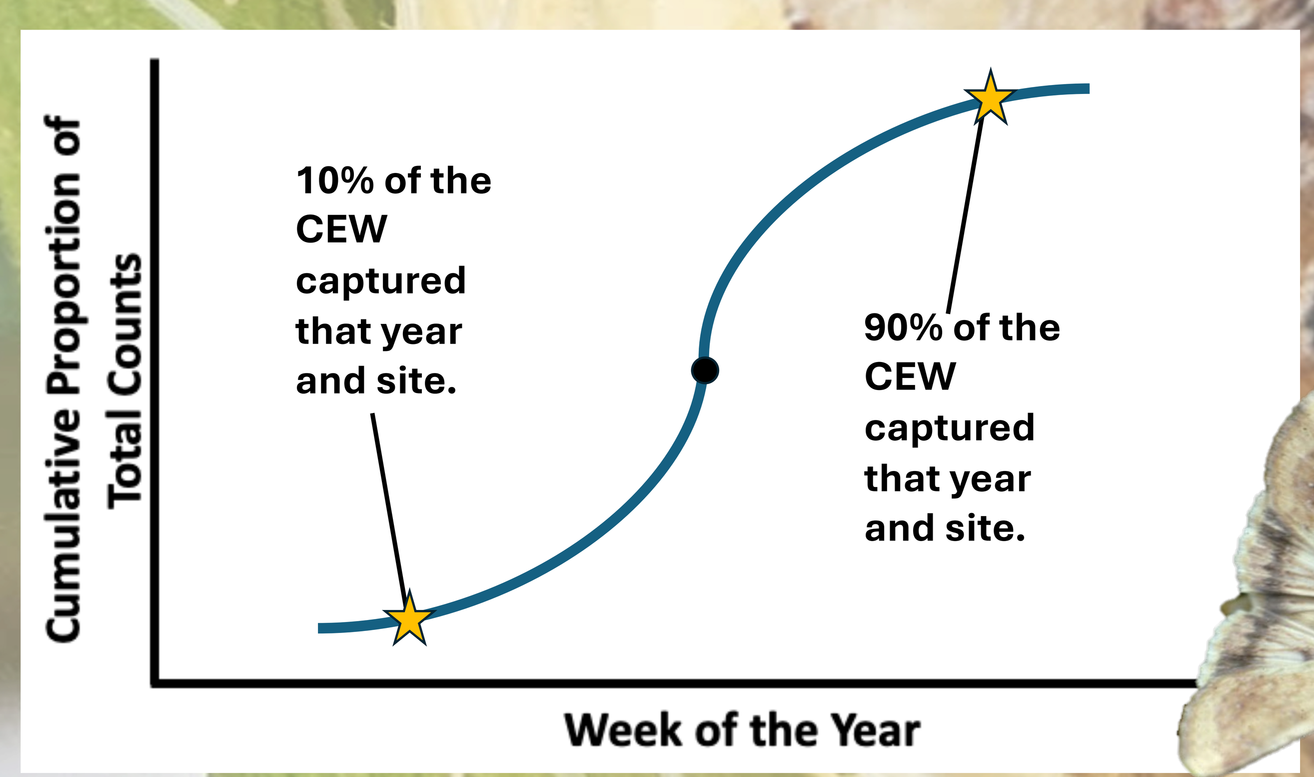
Modeling Shifts in Phenology over Time

- Modeled shifts in timing of early and late activity from 1981-2021 using a GLM across each trap type.
- Examined differences between "north" and "south" and included site as random intercept.

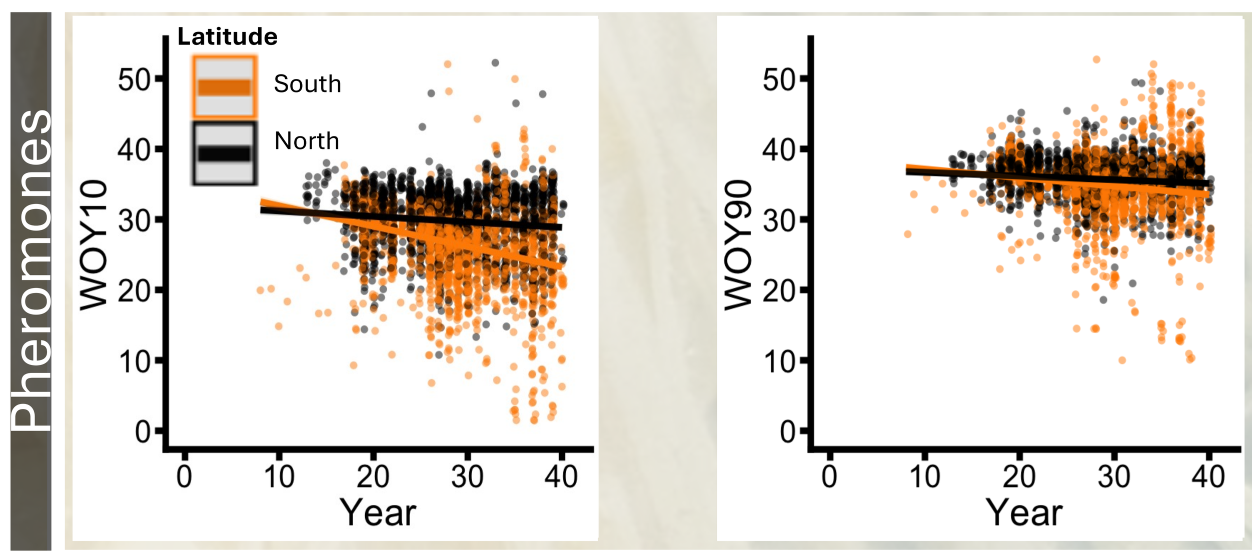
Modeling Shifts vs Temperature

- Mean monthly temperature curated using PRISM Climate Group data for each site
- Used a linear model that related corresponding week of year estimates to seasonal temperature



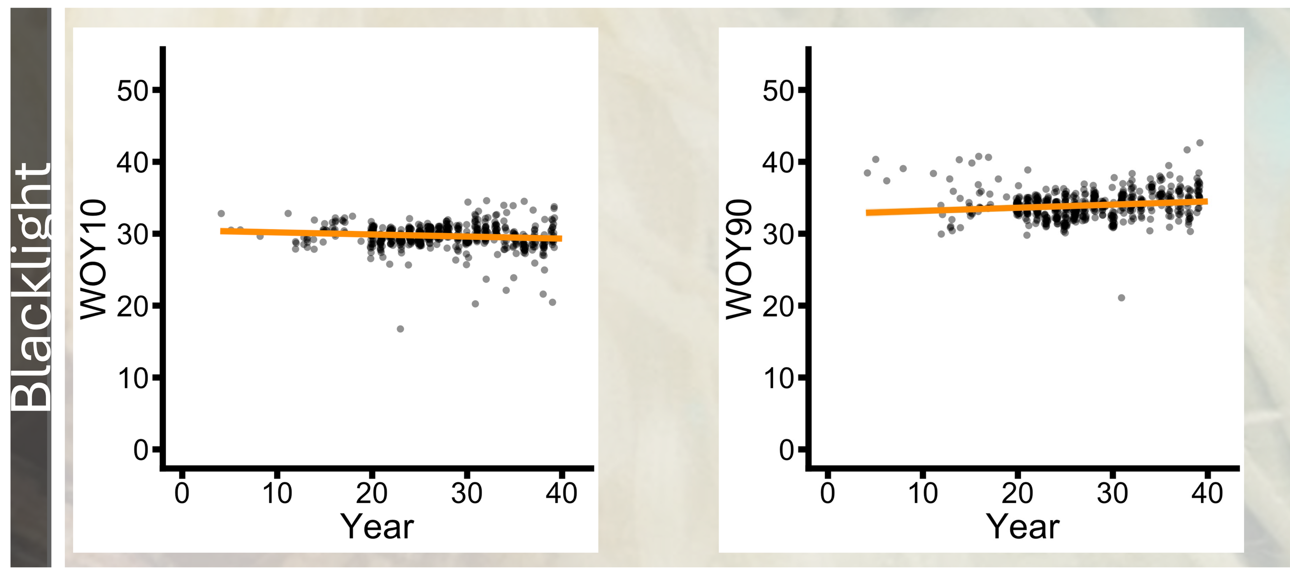


Results



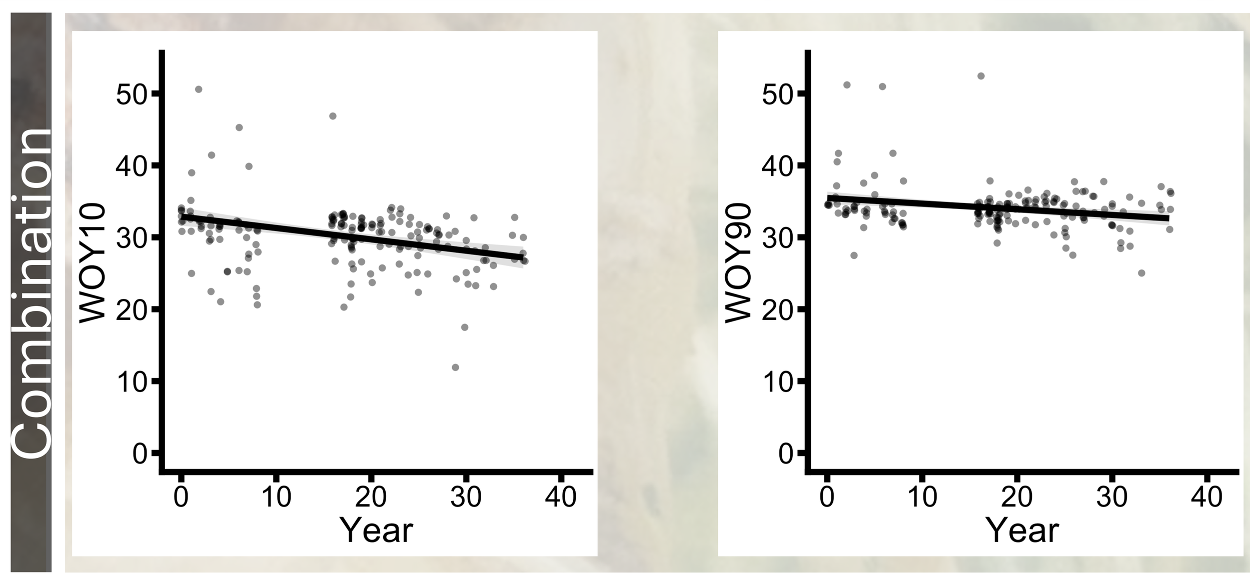
WOY10: Across the 41 years, activity in northern sites shifted an average 23 days earlier, while activity in southern sites shifted an average 84 days earlier.

WOY90: Activity in northern regions shifted 15 days earlier, whereas activity in the southern region had an average shift of 33 days earlier.



WOY10 : Black light traps were only used in the south, mostly in North Carolina. CEW activity shows a shift of about 8-days earlier on average across the 41 years.

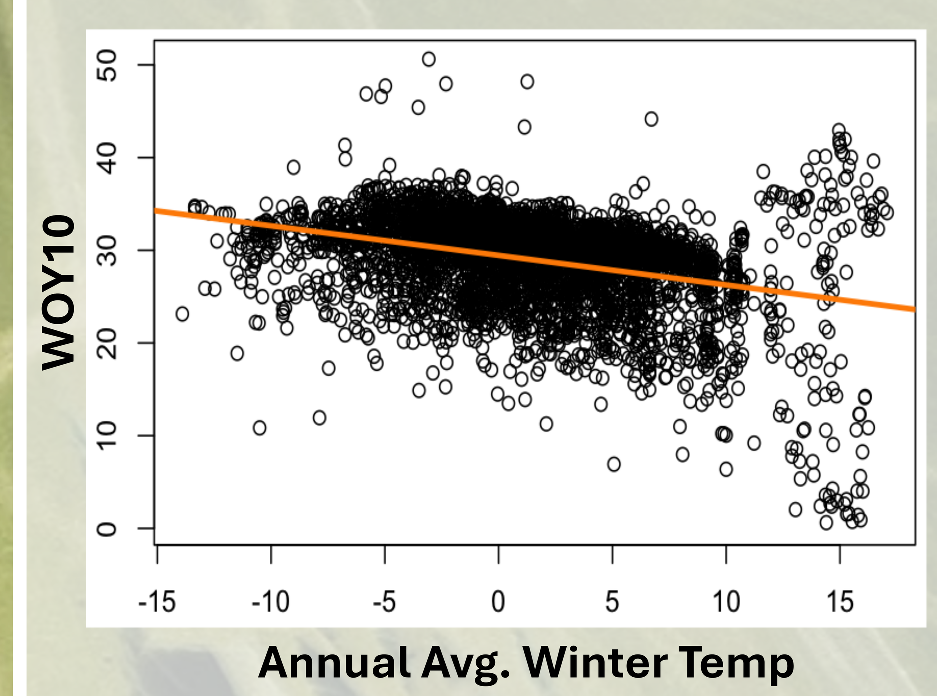
WOY90: In contrast, CEW late activity shifted later, in this case by 13 days.

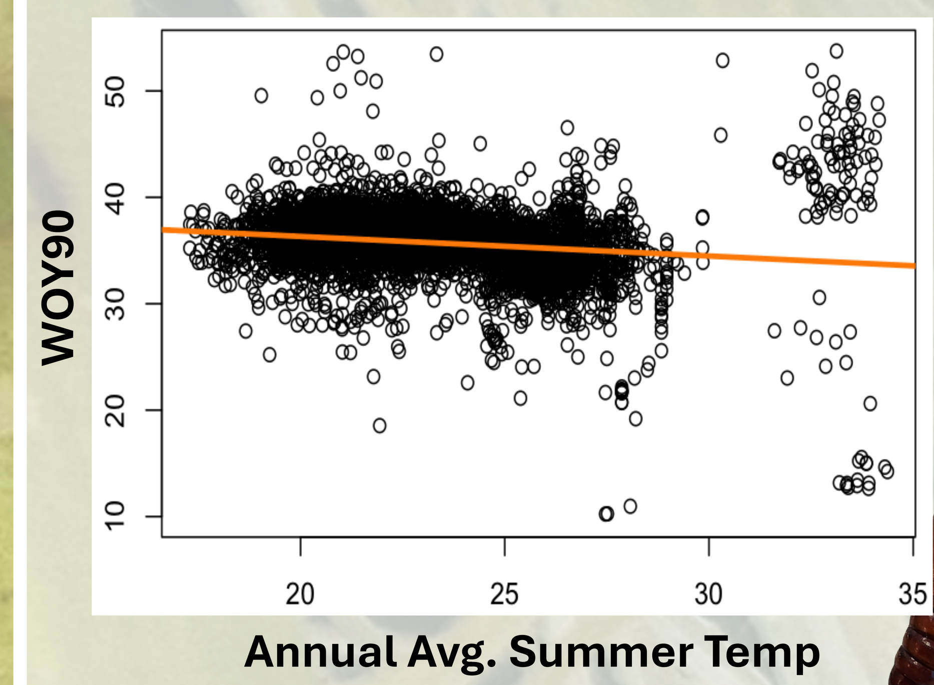


WOY10: Combination traps were only used in the north until 2017, so across 37 years early activity shifted 45 days earlier.

WOY90: Late activity shifted 23 days on average.

CEW capture activity occurred sooner where and when temperatures were warmer both during the winter and summer.





Implications

Across all trap types, early activity is shifting earlier at a faster rate than late activity, suggesting that the period of CEW activity is expanding as the years progress.

Similar shifts in late activity might be revealed if trapping networks were run longer into the fall/winter.

Shifts in early and late CEW activity could be due to changes in overwintering range and migration pathways or timing.

Determining the natal origin of early-stage CEW could reveal important changes in overwintering and migration patterns.

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

Acknowledgements: This work is supported by the Specialty Crop Research Initiative program [grant no. 2023-51181-41157/project accession no. 1031455], from the U.S. Department of Agriculture's National Institute of Food and Agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and should not be construed to represent any official USDA or U.S. Government determination or policy.

Iterative forecasting and management of corn earworm with advanced geospatial modeling

Evan Dadson[a], Chris Jones[a], Ross Meentemeyer[a], Anders Huseth[b]

[a]Center for Geospatial Analytics, *North Carolina State University*, Raleigh, NC [b]*Michigan State University*, East Lansing, MI

Contact: edadson@ncsu.edu

Introduction

Corn earworm (*Helicoverpa zea*) is a major pest of sweet corn, row crops, and vegetables. Descriptive spatial models have advanced management of this species. However, current models don't leverage rich sources of data from extension professionals and farmers to forecast movement and make better management decisions. Geospatial approaches to predict *H. zea* infestations will allow growers to plan, test, and apply multiple scenarios which are needed to improve control. The pest or pathogen spread model (PoPS) is a forecasting tool that allows stakeholders to work with modelers to test feasible management strategies.

Our goal is to calibrate and validate PoPS to forecast corn earworm spread during the growing season using several decades of data.

Methods

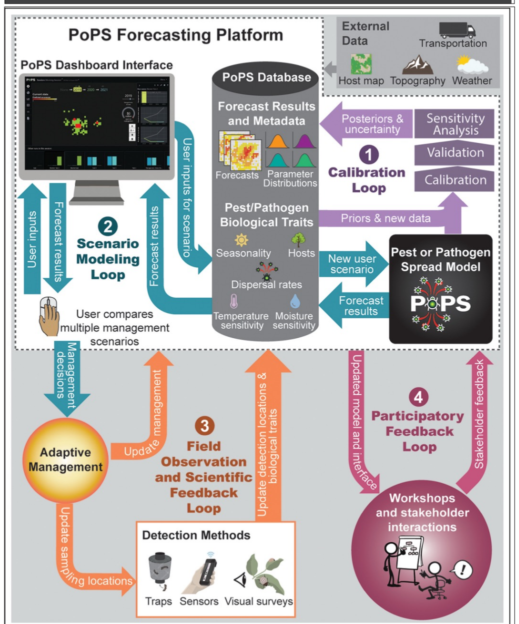


Fig. 1. PoPS forecasting platform. The model operates on an iterative modeling cycle[1]. The spread parameters are calibrated and validated by researchers and stored in a database. As more data is collected, the model parameters are updated. Stakeholders can interact with forecasts by testing control strategies.

Applications

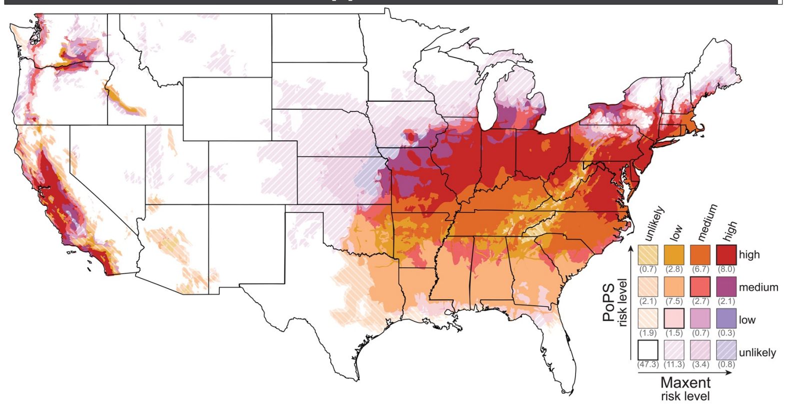


Fig. 2. Forecasting. PoPS has been used to forecast the spread of the spotted lanternfly (*Lycorma delicatula*) across the continental United States[2]. In this figure, authors compare the forecasted distribution and uncertainty of spotted lanternfly invasion between PoPS and the popular maximum entropy model used for niche modeling, MaxEnt[2]. This example shows how PoPS can be used to capture the long-distance dispersal ability of a pest.

Fig. 3. Adaptive management. Adaptive management is available with PoPS to guide simulations and scenario planning[3]. Using this tool, growers can test out management and treatment scenarios, such as applying pesticides and removal of potential hosts and pests. This example shows how PoPS can be used to manage an emerging plant disease, sudden oak death, in Oregon and California.

Future Directions

1. A study is underway to understand the lagged associations between sites where overwintering populations may be present (southern) and sites with what we assume to be predominantly migrant moths (north).
2. The PoPS model will be calibrated and validated using several decades of trapping data[4].
3. Supplement PoPS with other sources of data, such as radar, weather conditions, and other drivers with artificial intelligence and machine learning to improve corn earworm forecasts.

Further Information

PoPS Model Website

References

1. Jones, C., Jones, S. Petrasova, A., Petras, V., Gaydos, D.A., Skrip, M.M, Takeuchi, Y., Bigsby, K., & Meentemeyer, R.K. (2021). Iteratively forecasting biological invasions with PoPS and a little help from our friends. *Frontiers in Ecology and the Environment*, 19(7), 411-418.
2. Jones, C., Skrip, M.M., Seliger, B.J. *et al.* Spotted lanternfly predicted to establish in California by 2033 without preventative management. *Commun Biol* **5**, 558 (2022). https://doi.org/10.1038/s42003-022-03447-0
3. Petrasova, Anna, Devon A. Gaydos, Vaclav Petras, Chris M. Jones, Helena Mitasova, and Ross K. Meentemeyer. (2020). Geospatial Simulation Steering for Adaptive Management. *Env. Mod. & Soft.* 133 (November): 104801.
4. Lawton, Douglas; Huseth, Anders S.; Kennedy, George G. et al. (2022). Pest population dynamics are related to a continental overwintering gradient. *Proc. Natl. Acad. Sci. U.S.A.* 119 (37) e2203230119.

Acknowledgements

A special thanks for the Biological Invasions lab for their input and feedback on design and analysis, the PoPS developers, and Anders Huseth for his input.

This work is supported by the Specialty Crop Research Initiative program [grant no. 2023-51181-41157/project accession no. 1031455], from the U.S. Department of Agriculture's National Institute of Food and Agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and should not be construed to represent any official USDA or U.S. Government determination or policy.

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

Developing an automated trap for monitoring of fall armyworm

Grace Tiwari[1], Edward Amoah[1], Heather Grab[1]

[1]Department of Entomology, The Pennsylvania State University, University Park, PA

BACKGROUND

Fig 1. a. pheromone bucket trap b. Fall armyworm adult male c. ear damage caused by larva

- Fall armyworm (*Spodoptera frugiperda*) is a highly polyphagous migratory lepidopteran pest, causing significant damage to agricultural crops[1,2].
- In sweet corn, larvae feed on foliage, ear tips, and sides, resulting in severe yield losses[1].
- Management relies on pesticides, which, although effective in the short term, presents risks such as resistance and non target effects on human health and environment[4,5].
- Monitoring is an essential IPM component to enable targeted interventions by optimizing the timing of pesticide application and recommend better spray practices[6].
- Monitoring conducted using universal pheromone bucket trap which is labor intensive and often result in inconsistent tracking[3].

OBJECTIVE

- To develop automated trap using sensor technology for real-time monitoring of fall armyworm moth

CURRENT STATUS

Core Components:

- Infrared break-beam sensors to detect month entry events
- Seeed studio microcontroller for data logging and processing
- Standard Great Lakes IPM® pheromone bucket trap
- Witty Pi 4 for real-time clock and power scheduling
- Portable power bank/ solar panel

Operation Logic:

- Each moth crossing the beam triggers an electronic count and timestamp
- System sleeps during the day to conserve energy and reduce non-target recordings
- Trap activates automatically from 8pm- 6am, matching the nocturnal activity of Fall Armyworm

Our current prototype detects object/ artificial paper moth entries in lab tests.

PROTOTYPE DESIGN

Fig 2. Automated trap structure, along with the assembled version in lab

NEXT STEPS

Wiring, 3D printing, overall hardware design → **Rearing moths in lab and testing the traps** → **Overall functionality approval and build more prototypes** → **Deploy traps across 4 locations in PA during summer 2026**

EXPECTED OUTCOMES

- Real-time daily moth capture for early warning system
- Applied across all sites of PA regional monitoring network (currently 30+ locations)
- Cost effective decision support tool for growers and educators
- Robust dataset for further forecasting and predictive modeling

LITERATURE CITED

[1]Andrews (1980), Florida Entomologist, 63(4):456-67

[2]Westbrook et al. (2016), International Journal of Biometeorology, 60(2)255-267

[3]Liu et al. (2022), Frontiers in Plant Sciences, 13:1051704

[4]Wu et al. (2023), Pest Management Science, 79(3)1094-1101

[5]Wan et al. (2025), Nature Communications, 16:1360

[6]Santaera et al.(2025), Smart Agricultural Technology, 10:100842

ACKNOWLEDGMENT

The research is supported from the Interdisciplinary Studies in Entomology, Computer Science and Technology Network (**INSECT NET**) which is supported by the National Science Foundation's Research Traineeship Program (Grant 2243979). Thank you to **PestWatch** program by Penn State Extension for providing weekly state-wide trap catches and timely recommendation for sweetcorn pests.

Insecticide efficacy with and without surfactants for *Helicoverpa zea* management in sweet corn

John W. Mahas, Christophe Duplais, Brian A. Nault

Department of Entomology, Cornell University, Cornell AgriTech, Geneva, NY, USA

Abstract

Corn earworm, *Helicoverpa zea* Boddie, is one of the most economically important pests of sweet corn in the eastern United States. Insecticides are used to manage *H. zea*, and the addition of surfactants is commonly used to increase insecticide efficacy. However, it is unknown if surfactants improve insecticide efficacy against *H. zea*. This study sought to evaluate the performance of various surfactants with three commonly used insecticides for managing *H. zea* in sweet corn. Field trials were conducted in Geneva, New York from 2020 – 2022. Treatments consisted of three insecticides (lambda-cyhalothrin, spinosad, and chlorantraniliprole) applied alone or in combination with one of seven surfactants (MSO, NIS, NIS + MSO, O + S, SS, LPNIS, or OBNIS + MSO) plus a non-treated control. Not all combinations of insecticides and surfactants were included in the same experiment. Insecticide applications were made weekly for 2-3 weeks beginning in late August to early September. At harvest, 30 ears per plot were evaluated to quantify caterpillar presence and percent marketable ears. Under varying levels of *H. zea* infestation, insecticides typically reduced *H. zea* abundance and feeding damage compared with the non-treated control. The addition of surfactants did not significantly improve insecticide efficacy for either protecting ears or reducing larval abundance. These results indicate that growers can avoid unnecessary costs of adding surfactants to insecticides to manage *H. zea* infestations in sweet corn.

Introduction

- The corn earworm, *Helicoverpa zea* Boddie, is a major pest of sweet corn, *Zea mays* L. convar. saccharata Koern, in the U.S. (1).
- Females lay eggs on green silks, and neonates begin feeding on silks and then move into the ear tip to feed on kernels (2).
- Feeding damage and/or insect larvae beyond the tip of the ear renders the ear unmarketable for the processing market (1, 3).
- The fall armyworm, *Spodoptera frugiperda* Smith, and European corn borer, *Ostrinia nubilalis* Hübner, also feed on sweet corn, but tend to be sporadic pests in New York (NY).
- Foliar insecticide applications are used to protect ears; however, issues of insecticide resistance have been reported (4-5).
- Surface-active agents (surfactants) are used to solubilize, suspend, or disperse the active ingredient of a pesticide in its aqueous solution to crop foliage.
- Surfactants co-applied with pesticides should enhance pesticide efficacy; however, this has not been reported for *H. zea* management in sweet corn.

Figure 1. *Helicoverpa zea* larva feeding on sweet corn.

Research Objective and Hypothesis

- **Objective**: Evaluate the performance of various surfactants with different commonly used insecticides for managing *H. zea* and other Lepidopteran pests in sweet corn.
- **Hypothesis:** Surfactants co-applied with insecticides will increase the efficacy of insecticides to manage *H. zea* and other Lepidopteran pests.

Methods

- Four small-plot sweet corn field trials were planted in early July in Geneva, NY, including one trial in 2020, one in 2021, and two in 2022 (2022A and 2022B) (Table 1).
- Each field trial was conducted using a randomized complete block design with 4-5 replicates and included all pairwise combinations of 1-3 insecticides with 2-5 surfactants, along with a non-treated control in which no insecticide or surfactant was applied (Table 1).
- Plots consisted of two rows (25-35 ft) flanked by two unplanted border rows.
- Sprayed with a CO2-backpack sprayer (2 flat fan nozzles); 15-30.8 gpa; 40 psi.
- Sprays began at approximately 75% silking, with one or two additional sprays applied 7 and, if most silks were still green, 14 days later.
- A total of 30 primary ears were harvested per plot and evaluated for processing quality (i.e., no caterpillar feeding beyond the tip of the ear).
- Generalized linear mixed models using PROC GLIMMIX in SAS were used to analyze data.

Table 1. Insecticide and surfactant treatments evaluated from 2020-2022 for Lepidopteran pest management in sweet corn.

Product name	Product description	Rate per acre or volume measurement (% v:v)	2020	2021	2022A	2022B
Insecticide	**Active ingredient**					
Lamcap II	Lambda-cyhalothrin	1.92 fl oz	+	+	+	+
Blackhawk	Spinosad	3.3 oz	+	+	—	+
Vantacor	Chlorantraniliprole	2.5 fl oz	—	—	—	+
Surfactant	**Surfactant type**					
LI-700	Non-ionic surfactant (NIS)	0.125% v:v	+	+	+	—
MSO	Methylated seed oil (MSO)	16 fl oz	+	+	+	—
Phase	NIS + MSO	0.125% v:v	+	+	+	—
Tactic	Organosilicone + sticker (OS)	0.125% v:v	+	+	+	—
Nu-Film P	Spreader sticker (SS)	8 fl oz	+	+	+	—
Dyne-Amic	Organosilicone-based non-ionic surfactants (OBNIS) + MSO	0.25% v:v	—	—	—	+
Bond Max	Latex polymer NIS	0.25% v:v	—	—	—	+

Results and Discussion

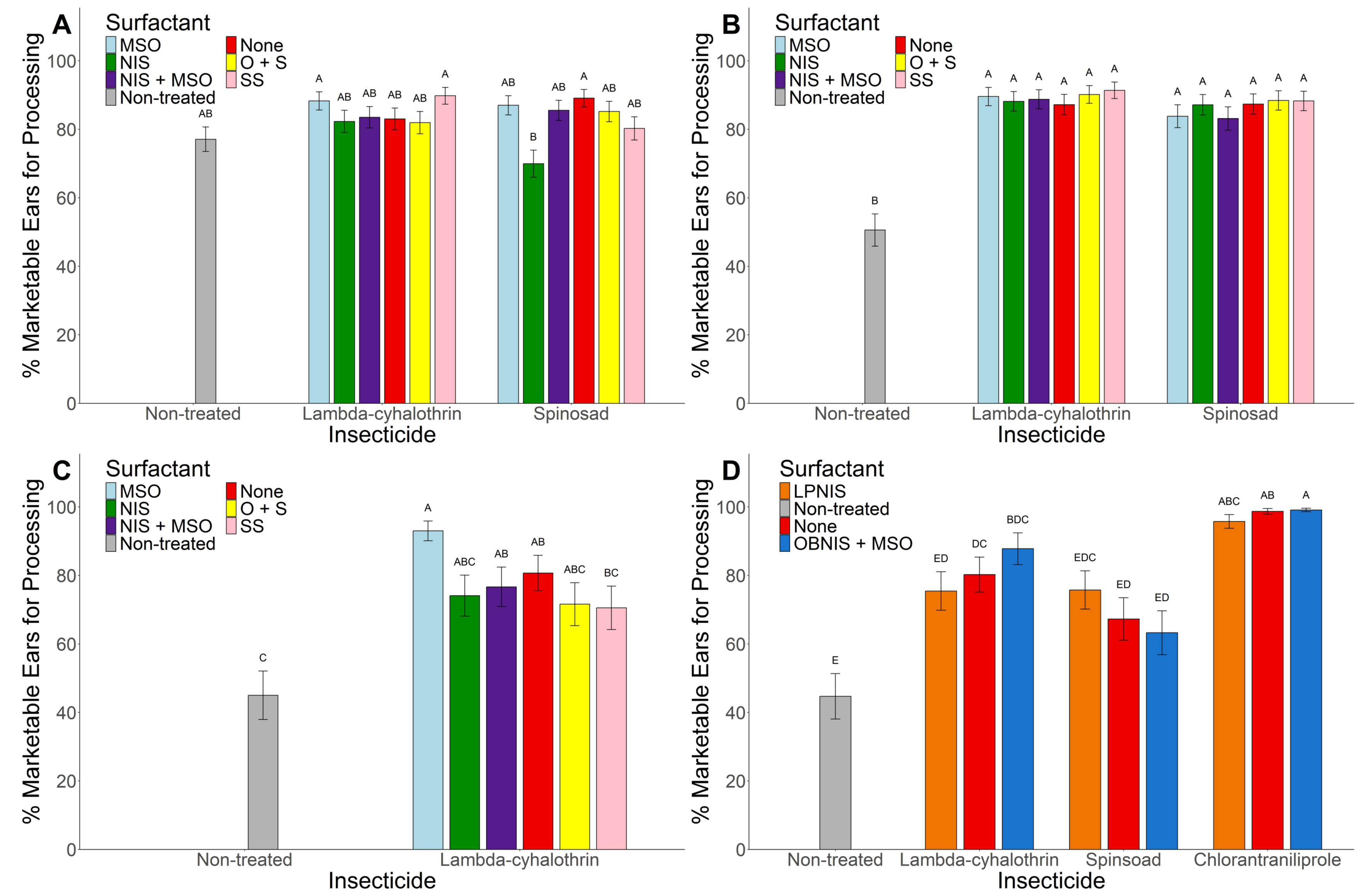


Figure 2. Percentage mean (± standard error) processing market quality ears for each treatment in (A) 2020, (B) 2021, (C) 2022A, and (D) 2022B. Means followed by the same letter are not significantly different ($P > 0.05$).

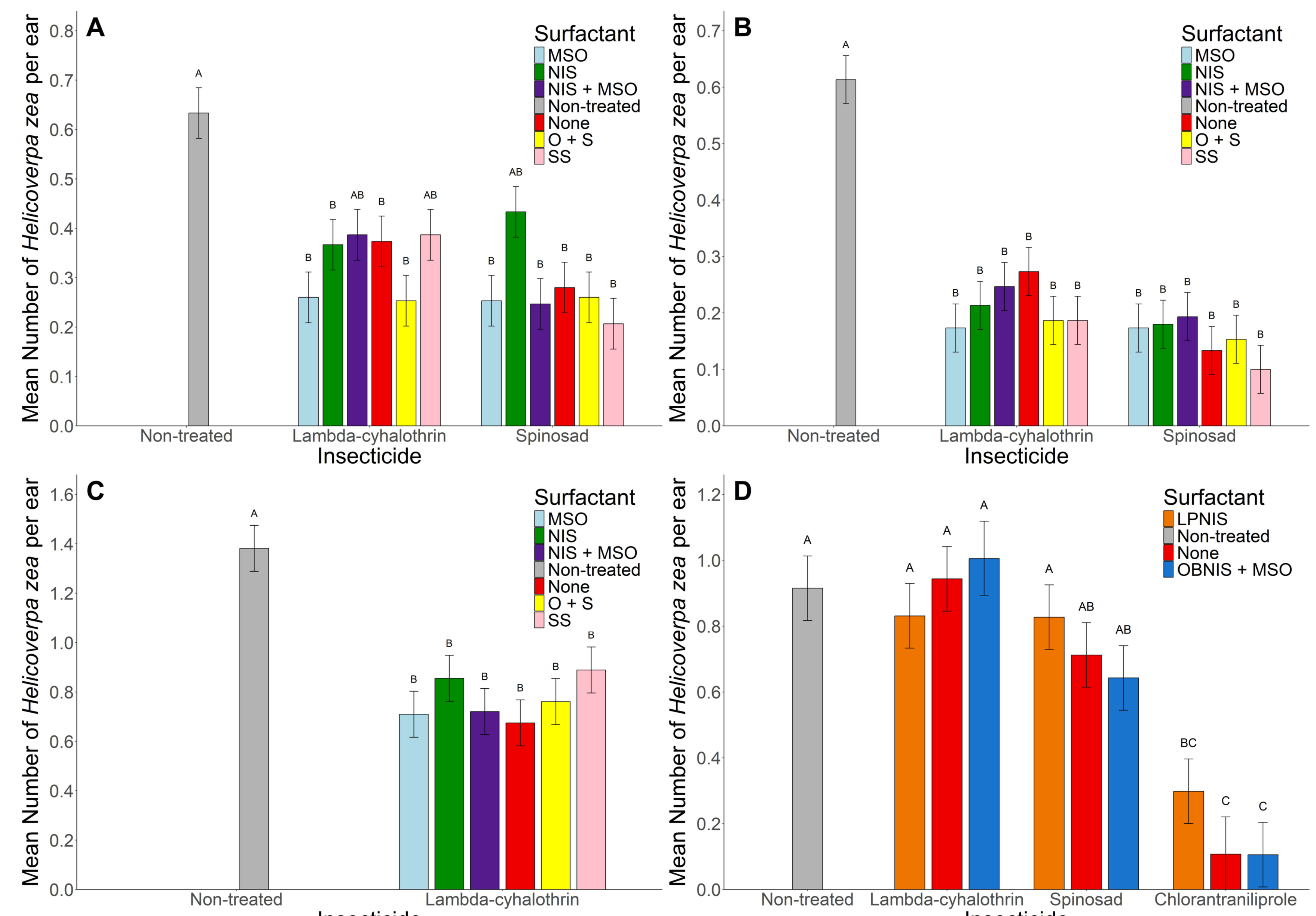


Figure 3. Mean (± standard error) number of *Helicoverpa zea* for each treatment in (A) 2020, (B) 2021, (C) 2022A, and (D) 2022B. Means followed by the same letter are not significantly different ($P > 0.05$).

- *Helicoverpa zea* was the primary Lepidopteran pest in all years of this study as *S. frugiperda* and *O. nubilalis* consisted of only 5.76% of the relative species composition (*H. zea* consisted of the remaining 94.24%).
- None of the surfactants significantly improved insecticide efficacy required to protect ears from *H. zea* damage (Figures 2 and 3).
- Insecticides alone, and in combination with different surfactants, significantly increased the percentage of marketable ears for processing in all treatments in 2021, most in 2022A and 2022B, and none in 2020, although most were numerically higher than the non-treated control (Figure 2).
- Insecticide sprays alone, and in combination with different surfactants also significantly reduced the number of *H. zea* larvae per ear in all treatments in 2021 and 2022A, and some in 2020 and 2022B compared with the non-treated control (Figure 3).
- While the use of surfactants did not improve insecticide efficacy in this study, these results are valuable because growers can omit using surfactants in their insecticide spray programs for *H. zea* and Lepidopteran pest management in sweet corn.

Acknowledgements

Cornell University. National Institute of Food and Agriculture, U.S. DEPARTMENT OF AGRICULTURE. NYSVGA

- This project is supported with partial funding through the New York State Vegetable Growers Association, Cornell University, and the USDA Specialty Crop Research Initiative. We would like to thank members of our labs for their assistance with this project.

References

1. Olmstead DL, Nault BA, and Shelton AM, Biology, Ecology, and Evolving Management of *Helicoverpa zea* (Lepidoptera: Noctuidae) in Sweet Corn in the United States, J Econ Entomol. 109:1667–1676, Entomological Society of America (2016).
2. Hardwick DF, The Corn Earworm Complex, Memoirs of the Entomological Society of Canada 97:5–247, Cambridge University Press (CUP) (1965).
3. Shelton AM, Management of Lepidoptera on Processing Sweet Corn in Western New York, J Econ Entomol. 79:1658–1661 (1986).
4. Jacobson A, Foster R, Krupke C, Hutchison W, Pittendrigh B, and Weinzierl R, Resistance to Pyrethroid Insecticides in *Helicoverpa zea* (Lepidoptera: Noctuidae) in Indiana and Illinois, J Econ Entomol. 102:2289–2295 (2009).
5. Rabelo MM, Paula-Moraes V S, Pereira EJG, and Siegfried BD, Demographic Performance of *Helicoverpa zea* Populations on Dual and Triple-Gene Bt Cotton, Toxins (Basel) 12 (2020).

Bt Resistance Monitoring in Sweet Corn Using a Multi-State Network

Veronica Yurchak[1], Galen Dively[2]

[2]University of Maryland Extension , [2]Department of Entomology - University of Maryland, College Park

Introduction & Background

Sweet corn sentinel monitoring has been conducted annually since 2017 to track changes lepidopteran pest susceptibility to Cry and Vip3A toxins expressed in Bt corn and cotton. Seed is provided each year by Syngenta and Bayer-Seminis and is repackaged and distributed to volunteer collaborators, who establish sentinel plantings of Bt and non-Bt hybrids using a standardized planting and data-collection protocol. Control efficacy is assessed by comparing larval densities in Bt versus non-Bt ears, and phenotypic frequency of resistance (PFR) is estimated as the ratio of larval density in Bt ears to that in non-Bt ears. A significant reduction in control efficacy accompanied by increased PFR is interpreted as evidence of field-evolved resistance.

2025 Objectives

2025 monitoring emphasized the Vip3A trait and improved timing of larger ear samples to detect early resistance. The network involved 58 sentinel plantings in 28 states and 5 Canadian provinces. All locations included at least one planting of 'Remedy' expressing Cry1Ab + Vip3A, and its non-Bt isoline 'Providence'.

Bt Sweet Corn Trait Package Efficacy

ATTRIBUTE® (Syngenta)

- Protein(s) Expressed: Cry1Ab
- Insect Control:
  - Corn earworm: no control - all locations
  - European corn borer: 100% control everywhere except Eastern Canada and Connecticut (2024)
  - Fall armyworm: poor control in ear
  - Western bean cutworm – no control

Performance Series ™ (Seminis)

- Protein(s) Expressed: Cry1A.105, Cry2Ab2
- Insect Control:
  - Corn earworm: no control - all locations
  - European corn borer: 100% control – all locations except Eastern Canada and Connecticut (2024)
  - Fall armyworm: good control
  - Western bean cutworm – fair control

ATTRIBUTE® II; ATTRIBUTE ® PLUS (Syngenta)

- Protein(s) Expressed: Cry1Ab, Vip3A
- Insect Control:
  - Corn earworm: 100% control - all locations
  - European corn borer: 100% control – all locations except Eastern Canada and Connecticut (2024)
  - Fall armyworm: 100%
  - Western bean cutworm – 100%

Target Pests

Corn earworm

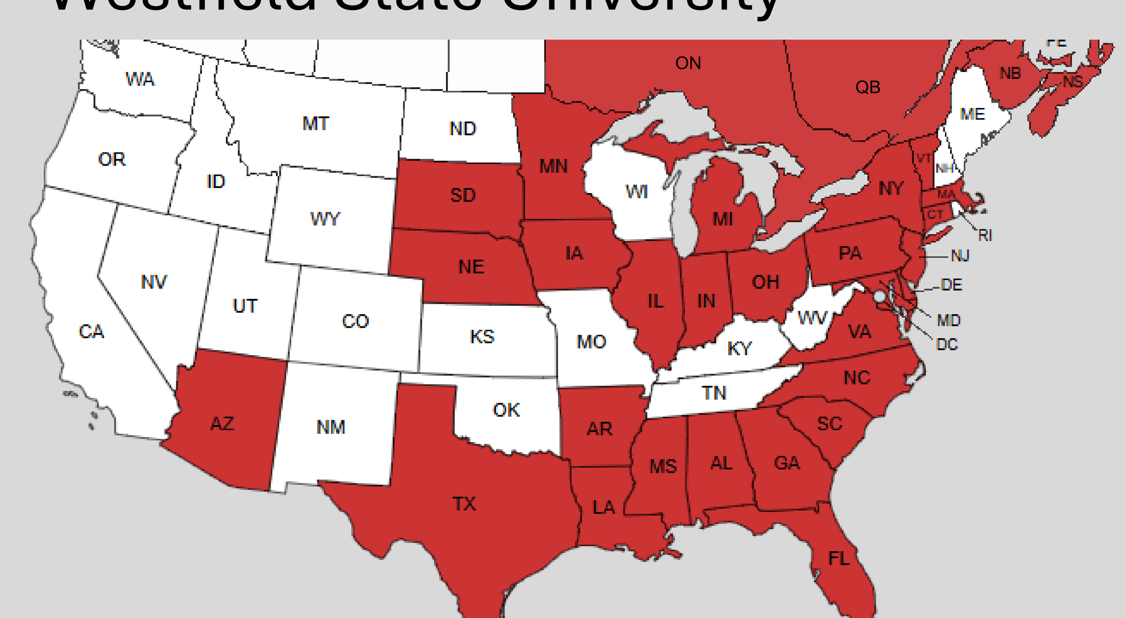
European corn borer

Fall armyworm

Western bean cutworm

2025 Collaborators

- University of Arkansas
- University of Arizona
- Auburn University
- CÉROM, Quebec
- Clemson University
- Connecticut Agricultural Experiment Station
- Cornell University
- University of Delaware
- University of Florida
- University of Georgia
- University of Guelph
- Government of New Brunswick
- Government of Prince Edward Island
- University of Illinois
- Iowa State University
- Louisiana State University
- University of Maryland
- Michigan State University
- University of Minnesota
- Mississippi State University
- University of Nebraska – Lincoln
- North Carolina State University
- Ohio State University
- Pennsylvania State University
- Perennia Food & Agriculture
- Purdue University
- Rutgers University
- Texas A&M University
- USDA-ARS
- University of Vermont
- Virginia Tech University
- Westfield State University



Acknowledgements

We thank the collaborators, farm managers, and field technicians at each trial location for establishing and maintaining sweet corn plots and for their help in collecting and analyzing all data. We also thank Syngenta and Bayer-Seminis for providing sweet corn seed.

Preliminary Magnet Investigation 2024

David Owens and Ben Sammarco

University of Delaware

What is Magnet?

Magnet is a food-bait matrix that emits 6 floral compounds that attract Noctuid moths to feed

Manufactured by Australian company AgBiTech

Fewer non-target impacts

Claimed efficacy 4-6 days

Reduces adult moths and egg deposition in crop

How Magnet Used/ Evaluated?

Tank mixed with methomyl or spinetoram

Company recommends application to 2% crop, minimum 10 acre size

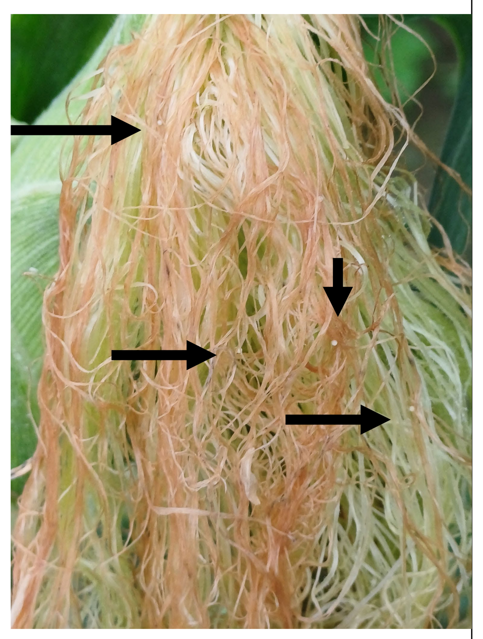
Narrow banded application every 120 feet , 5 oz/100 row ft ~ 36 ounces/acre. Want Ultra Course droplets

Applied at tassel push in evening

NOT diluted with water

In Australia,boom sprayers setup with a dedicated nozzle and secondary tank to co-apply with silk sprays

Efficacy evaluated through egg counting!



Registration Process

IR-4 facilitated trials in CO and DE and in discussion with EPA to register

The IR-4 Project

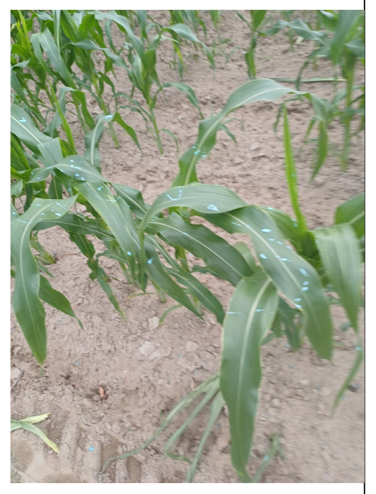
IR-4 Delaware Trial Fields

1. 'Distant Control' – no ist 1.3 acres, 3 miles away
2. Magnet field + Grower Standard. 11.6 ac
   b. Magnet – no insecticide. Grower agreed not treat 16 edge rows
3. 'Local Control' = Grower Standard, no Magnet 11.4 ac
   b. 'Local Control no insecticide' grower agreed not to treat 16 edge rows

0.4 miles separated Magnet field from 'Local Control' field

The Application

1 strip / 90 feet. Fertilizer stream jet nozzle with CO_2 pressurized single nozzle backpack spray wand



Dusk applications

Crop destruct!

7 applications tank mixed with either Lannate or Radiant

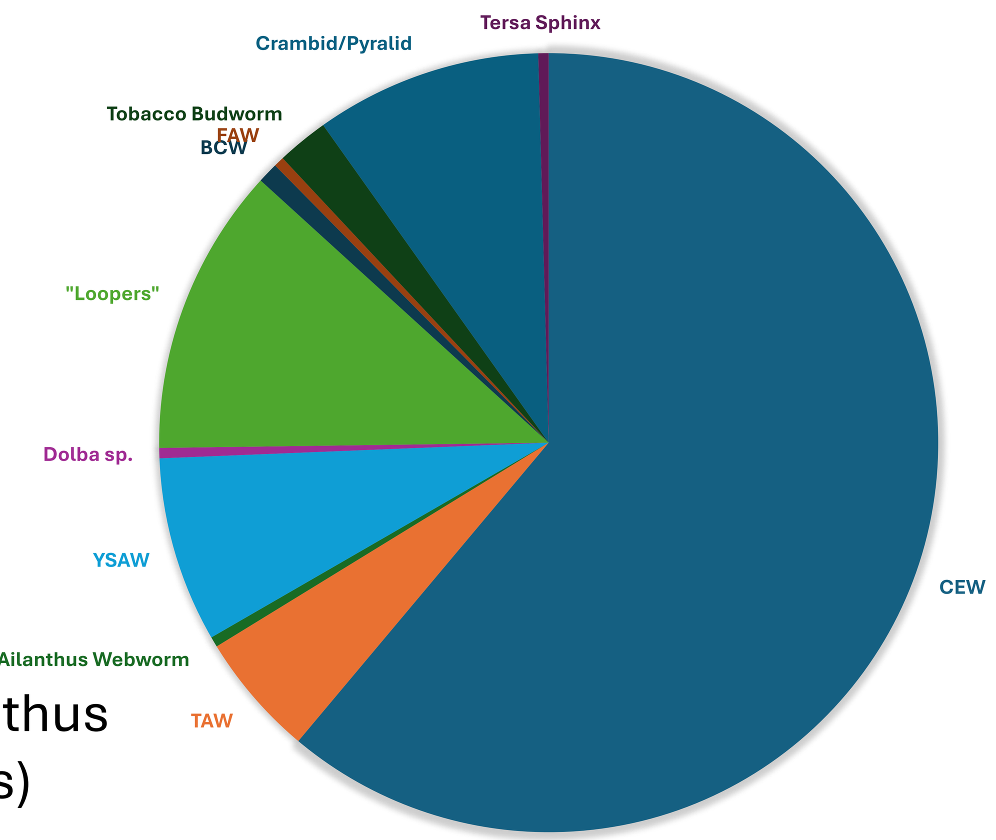
Results

Collected dead moths 2,400 trt row-ft after Magnet + Lannate

234 moths

1 43 CEW (61%)

Non-Ag, non-targets:
10% (2 sphinx, 1 Ailanthus webworm, 22 pyralids)



Support from Calloway Farms and appreciation to Irene Ernest, Victoria Smith, Jase Hudson, Violette Blackham

Results

Grower Standard Insecticide Apps suppress egg deposition

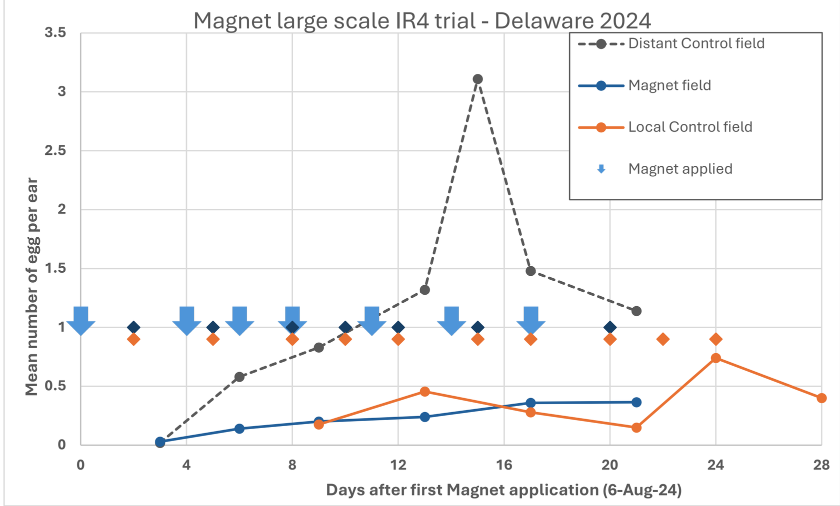
Slightly fewer eggs in 'Magnet + Grower Standard' than 'Local Control grower standard'

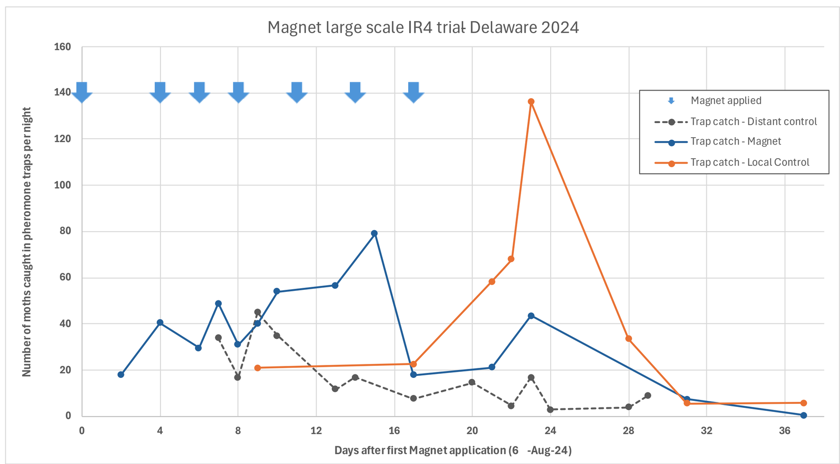
Pheromone trap capture = high, constant pressure

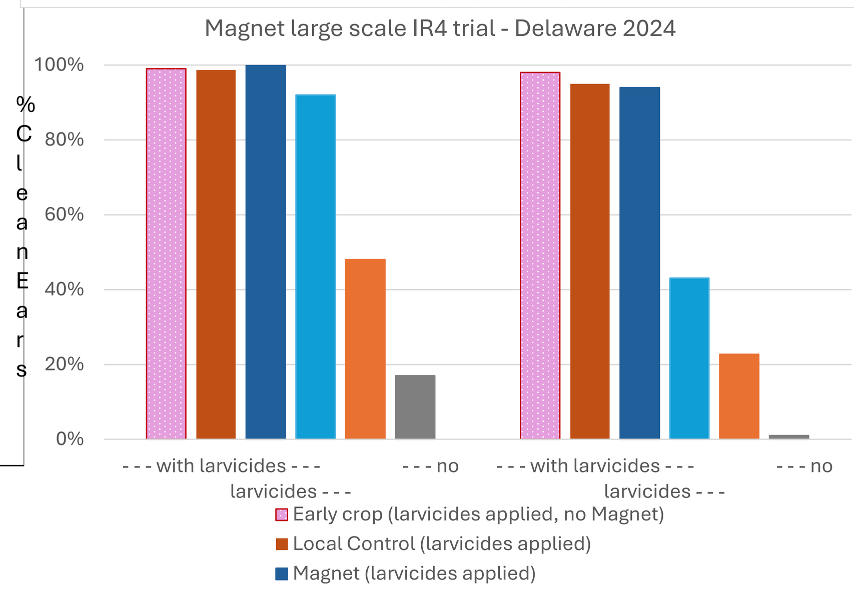
Ear damage at harvest: Magnet + G.S = Local Control + IST.

Magnet - IST = less damage than Local Control – IST

Distant Control – fewer moths, extreme damage and egg counts







Questions Need Answering

Single replicate. Promising, but need research and **registration**. Crop destruct expensive. Need large, paired fields and ++ product

Could Magnet have helped suppress trap counts and eggs in both fields vs 'Distant Control'?

Work better in larger fields? Processing?

Center Pivot affects?

What about lower pressure conditions?

If registered, could this make a 3-4 d spray schedule equal to a 2-3 d spray schedule b/c killing moths? (or relax a spray schedule?

CEWIPM.org

Residual Toxicity of Sweet Corn Silk Sprays on a Common Beneficial Lady Beetle

Brian Currin and Thomas Kuhar

Dept. of Entomology, Virginia Tech, Blacksburg, VA

Introduction

- Insecticides are applied often during sweet corn silking to control pests like corn earworm.
- Many beneficial insects are drawn to pollinating corn and are susceptible to the insecticides used.
- One common beneficial insect found in corn is the pink lady beetle, *Coleomegilla maculata*, which is a predator of corn earworm eggs and other pests like aphids (Fig. 1).
- This study aimed to evaluate the residual toxicity of 3 popular insecticides: chlorantraniliprole (Vantacor); spinetoram (Radiant); and bifenthrin along with a new insecticide isocycloseram = Plinazolin (Incipio™) applied to sweet corn silks then exposed to *C. maculata* at different intervals.

Figure 1. *Coleomegilla maculata.*

Methodology

- Field experiments were conducted in 2024 and 2025 in Whitethorne, VA. Insecticides were directed on silks during pollen shed using a backpack sprayer every 2 days.
- Treated silks were flagged for later collection to assess each insecticide treated 2, 4, and 6 days before bioassay set up.
- Sets of 5 lady beetles were placed in 50-ml tubes with treated silks collected from the plots (Fig. 2)

Figure 2. Falcon™ tubes 50-ml containing treated silks and *Colemegilla maculata.*

Methodology Cont.

- Beetle mortality was assessed 72 h after exposure to excised silks from treated plots.
- Data were analyzed using ANOVA and Fisher's Protected LSD to separate means.

Results

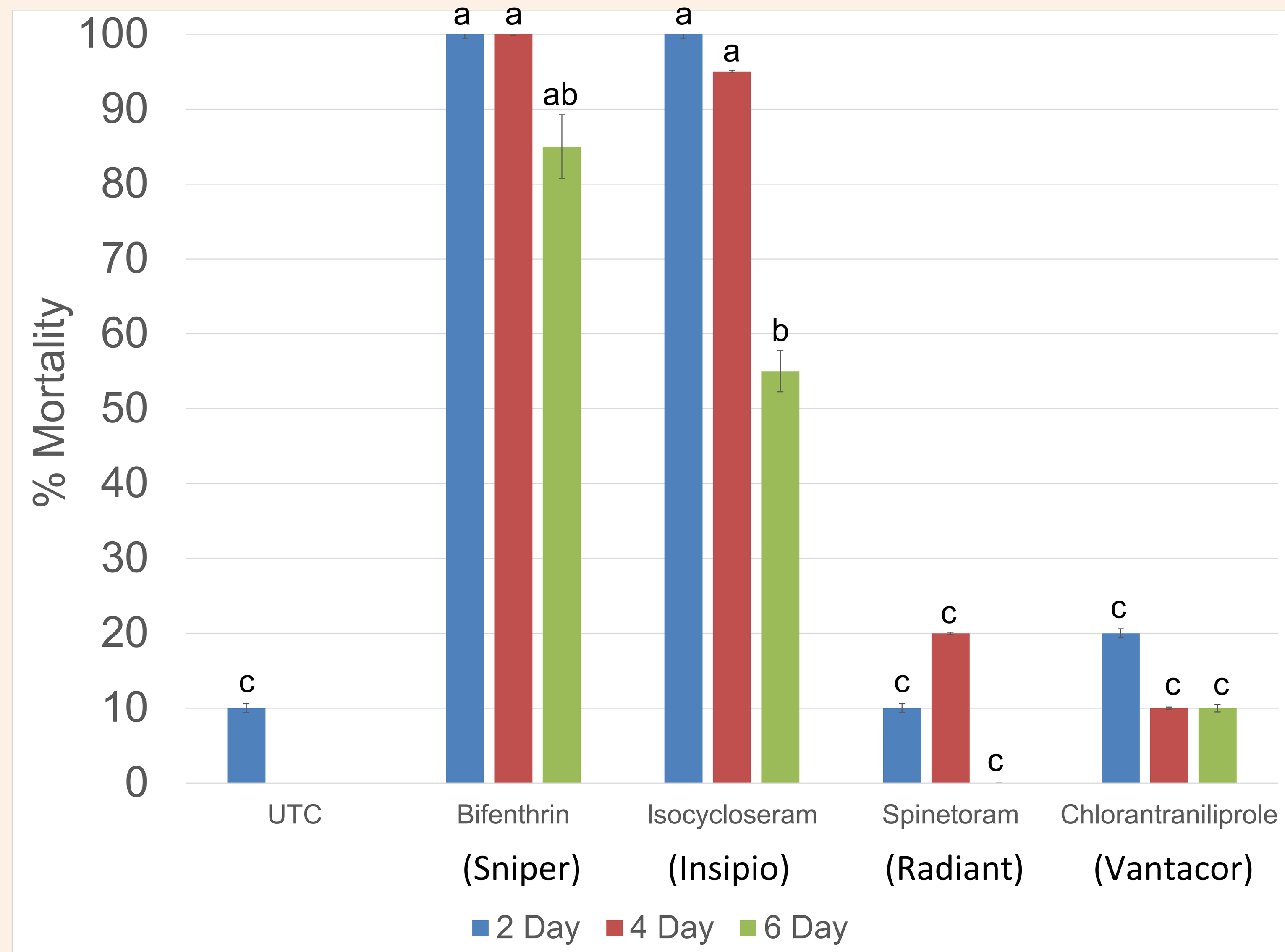


Figure 3. % Mortality of *Coleomegilla maculata 72* h after being placed on treated silks (2024) p<0.0001.

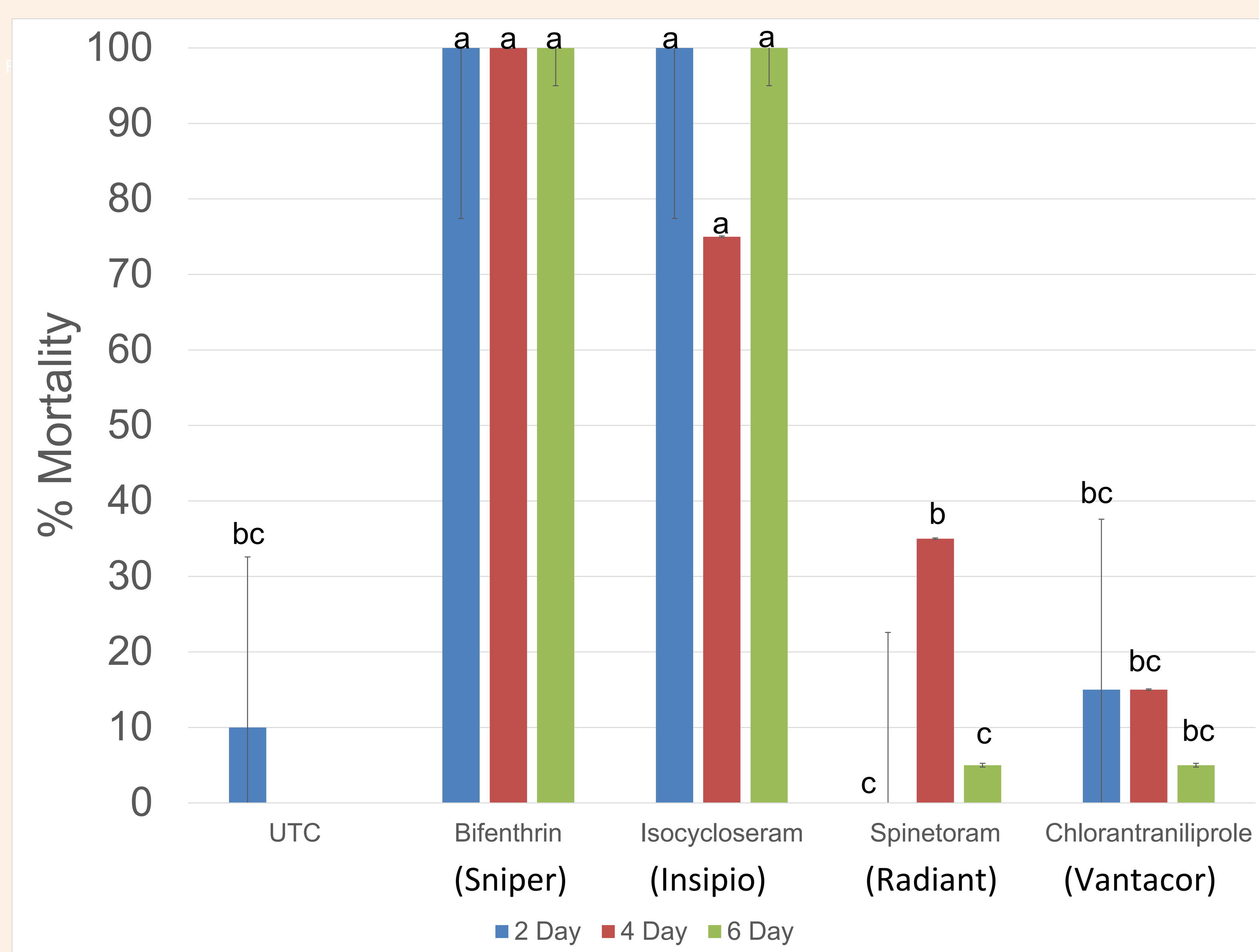


Figure 4. % Mortality of *Coleomegilla maculata 72* h after being placed on treated silks (2025) P<0.0001.

Experiment 2

- In a separate experiment in a commercial sweet corn field in Elliston, VA, yellow sticky traps were fastened using a golf tee pushed through the corn stalk at the ear.
- 20 ft plots on the edge of the field were sprayed with different insecticide treatments.
- Sticky cards were retrieved 1 week after and # lady beetles recorded.
- There were fewer in the bifenthrin treatment (Fig. 5), which illustrates the nontarget effects of pyrethroid insecticides like bifenthrin compared with more IPM-compatible options like chlorantraniliprole and spinetoram.

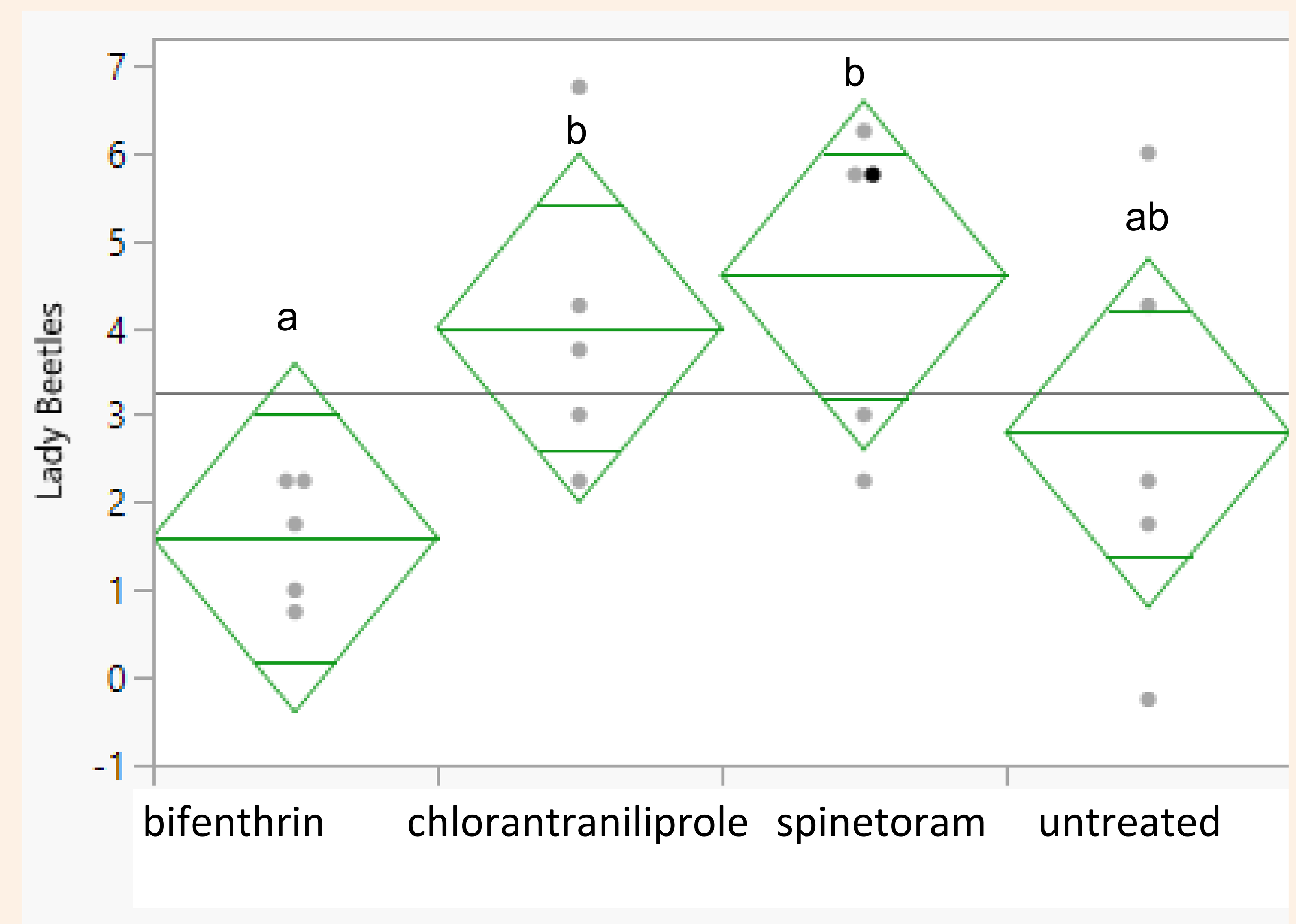


Figure 5. Numbers of *Coleomegilla maculata* on yellow sticky cards 1 week after insecticide treatments to sweet corn, Elliston, VA, Summer 2024.

Take home points

- Bifenthrin and isocycloseram caused significantly higher mortality than the untreated control, spinetoram, or chlorantraniliprole.
- Bifenthrin and isocycloseram were highly toxic to *Coleomegilla maculata* even after 6 days in the field.
- Specific considerations should be made on the use and timing of these insecticides to reduce non-target effects.

Acknowledgements

This study was funded in part by USDA-NIFA Specialty Crop Research Initiative, 2023-51181-41157. Insecticides were supplied by FMC, Syngenta, and Corteva.

ECONOMICS UPDATE: CORN EARWORM CONTROL IN SWEET CORN

FINDINGS FROM A GROWER SURVEY

JAMES MACDONALD & XUEYING SUN
University of Maryland | jmacdon2@umd.edu

UNIVERSITY OF MARYLAND 1856
DEPARTMENT OF AGRICULTURAL & RESOURCE ECONOMICS

BACKGROUND & MOTIVATION

Corn earworm (CEW) damage poses a major economic risk for fresh-market sweet corn growers. Even limited damage or the presence of larvae in ears can reduce marketability and sales. Despite this, there is limited cost-based data linking CEW control practices to overall production costs and returns.

This project uses new survey data to:

- Document current CEW control practices
- Estimate CEW control costs
- Integrate those costs into a broader sweet corn enterprise model
- Evaluate how changes in CEW control strategies affect profitability

THE SURVEY: TWO PAGES

Sweet Corn: CEW management practices and costs
(https://www.cewipm.org)

We are a team of entomologists and Extension staff addressing threats from corn earworm (CEW). Your responses to this short survey will lead to better guidance for sweet corn growers throughout the Eastern United States. This survey is intended for fresh-market growers only.

Questions? Contact James MacDonald, University of Maryland (jmacdon2@umd.edu).

A. Acreage and planting

1. Where is your farm located? State ____________ County ______________
2. How many acres of sweet corn did you plant in 2024? ________
   a. How many acres of sweet corn were irrigated in 2024? _______
   b. How many acres of sweet corn did you harvest in 2024? _______
3. How many different plantings of sweet corn did you do in 2024?_______
   a. On average, how many days passed between plantings? ________
4. In normal circumstances, how much corn would you harvest?
   Tons per acre ____; or dozen ears per acre ______; or crates (4 dozen) per acre _______
5. What share (%) of your sweet corn production went to each outlet type in 2024:
   a. Fresh, to wholesalers _____
   b. Fresh, direct to consumer via on-farm stand or farmers market _____
   c. Fresh, direct to retailer _____
6. Does CEW injury in the ear tip negatively affect your sales? Yes (Y)/No (N) _______
   a. Does the presence of CEW larvae in the ear negatively affect your sales? Y/N_____

B. Seeding

1. What was your seeding rate (seeds per acre) in 2024? ______
   a. Did you plant any genetically modified Bt seed in 2024? Y/N _____
   Answer below if Yes
   a.1 What share (%) of your acreage was planted to Bt? ______
   a.2 Were you more likely to plant Bt late in the season? Y/N _____
   a.3 What share (%) of your acreage was planted to varieties with the Attribute II and/or Attribute Plus Bt trait, such as Matriarch, Patriarch, Quick Trip, Remedy, Revision, Protector, or Pursuit? _______

C. Scouting

1. Did you use a crop consultant for scouting insects in 2024? Y/N ______
   a. If Yes, how much ($ per acre) did you pay the consultant? ______
   b. If No, how many hours were spent setting and checking traps in 2024? ____
   c. If No, how many hours were spent scouting for insect presence in 2024? _____

1. Trap Use

Leave blank if no traps are used

Pheromone Lure Brand Names:
Hercon Luretape: 01 **Trécé Pherocon: 03**
Alpha Scents: 02 **Scentry: 04**

Trap type	How many traps did you use in 2024?	What pheromone lure brand did you use? (see codes above)	On average, how often (weeks) do you change lures?
Blacklight		NA	NA
Hartstack (wire cone)			
Heliothis (plastic mesh)			
Other			

D. Insecticide use:

Method of application codes
Airblast sprayer: 01 **Aerial application: 04**
Drop nozzle sprayer: 02 **Drone: 05**
Boom sprayer: 03 **Backpack: 06**

1. Insecticide use table (example provided in 1st row): **for CEW control**

Row	Insecticide(s)	Method of application (see codes above)	Application rate, in ounces per acre		Number of applications per planting during silking and ear development		Number of days between applications	
			Early season	Late season	Early season	Late season	Early season	Late season
1	**Brand name**	**02**	**1.25**	**1.25**	**5**	**10**	**6**	**3**
2								
3								
4								
5								
6								
7								
8								

2. Check months that are late season for you: August___; September;___; October____;
3. Which insecticide rows in the table above are typically combined in a tank mix?
   Example: 1, 3, 5; 1st mix: ________; a 2nd mix:________;
4. At what corn growth stage did you apply the first application for ear-invading insects?
   a. Check the line next to the appropriate stage
   Vegetative____; Early tassel_____; Full tassel____; Early silk____; Full silk____
   b. Which insecticide did you apply? ___________

SURVEY OVERVIEW & RESULTS

Growers in the survey produced for fresh markets and covered a range of sizes.

Planted Acres	Responses
< 6	26
6-10	21
11-20	17
21-50	11
51-100	8
> 100	8
All	91

- Ninety-one growers from 10 States responded to the survey, with most from New York or Pennsylvania
- Respondents planted a total of 3,709 acres of sweet corn in 2024.
- On average, growers planted every eight days during the season, with a range of 5-10 days between plantings.
- That rate meant that growers averaged 10 plantings through the 2024 season, with a range of 5 to 17 plantings

CEW Damage Should Be a Greater Concern for Fresh Market Growers

MARKET OUTLETS

- The survey was targeted at growers for fresh markets, not processing
- Almost all survey growers sold to wholesalers, to retailers, and direct to consumers
- But half of their production went to retailers, with the other half split between wholesalers and direct to consumers

CEW DAMAGE

- Does corn earworm damage in the ear negatively affect your sales?
  - 79% of growers, with 89% of acres, said "yes"
- Does the presence of CEW larvae in the ear negatively affect your sales?
  - 74% of growers, with 87% of acres, said "yes"

FIELD PRACTICES SHAPING YIELDS & COSTS

Growers report average yields of 900 dozen ears per acre, with a wide range of 100 to 1,800.

Field Practices:

- Growers planted 21,000 seeds per acre, on average
  - But also with a wide range: 10,000 to 32,000 seeds per acre
- 65% of growers, with 75% of acres, irrigate their sweet corn
- 20% of growers reported using Bt (Bacillus thuringiensis) seeds on 5% of total planted acres
  - Those who planted Bt seeds did so on only some of their acres
  - Bt seeds are resistant to corn earworms, but face consumer opposition

INSECTICIDES FOR CEW CONTROL

INSECTICIDE CHOICES

- Growers reported using up to six insecticide products
  - A third used two products
  - One quarter used one, and one quarter used three
  - Just under half used lambda-cyhalothrin products
  - One quarter used Coragen products

INSECTICIDE APPLICATIONS

- Early season: growers averaged two applications per planting
- Late season: three applications, at a higher rate (oz/acre)
  - There's a wide range, with some making 8-10 applications
- Most growers make their first application at early tassel
- 80% of growers used a boom sprayer
  - One in six used an airblast sprayer

WHAT'S NEXT?

- Use the survey to choose a representative set of practices
  - Seed choices; irrigation; traps and scouting; insecticides and applications
- Pick representative farm types
  - By size and location
- Select prices/costs for each practice
  - Build up to CEW control costs, enterprise costs, and returns for each farm type
- Use those as baselines to evaluate the economic impact of alternative CEW control practices

CEWIPM.org
Corn Earworm Integrated Pest Management