



# Corn Insect Management 2023

Andy Michel  
with Kelley Tilmon and Field Crop Insect Team  
(<https://aginsects.osu.edu/home>)



**THE OHIO STATE UNIVERSITY**

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AND ENVIRONMENTAL SCIENCES





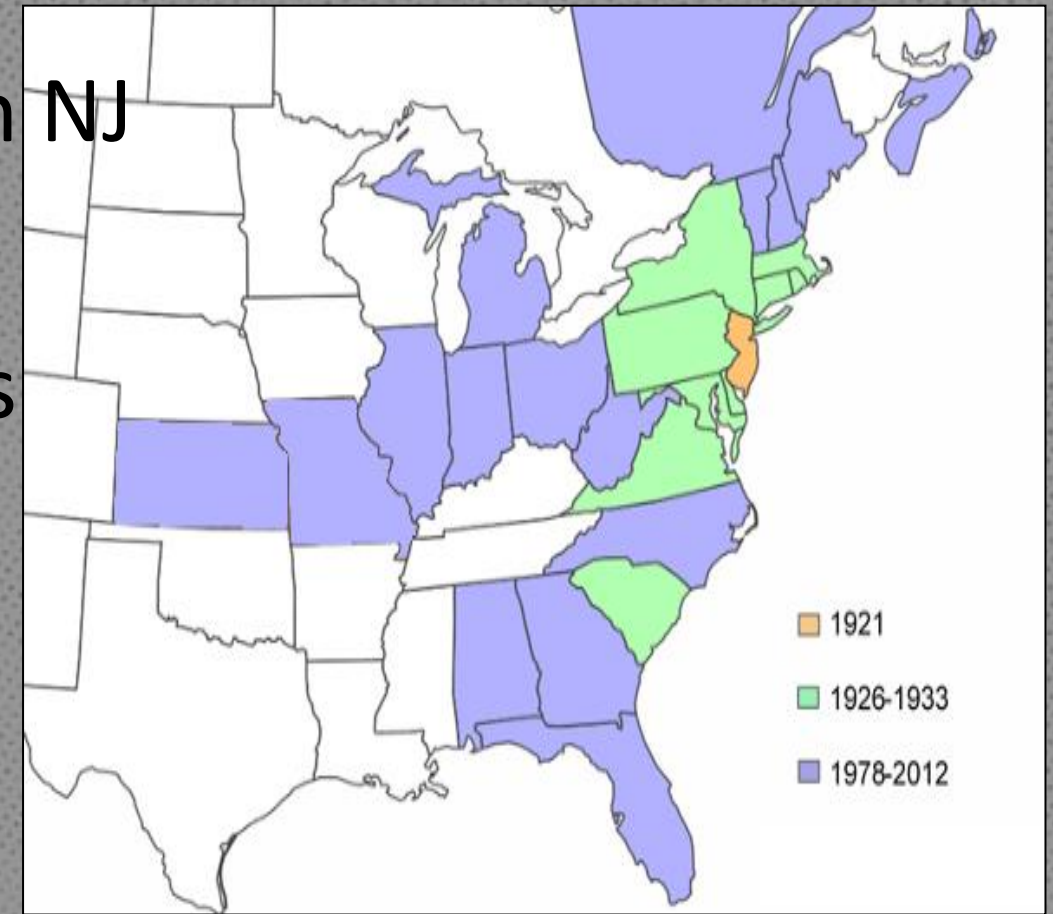
# Overview of Corn Insect Management

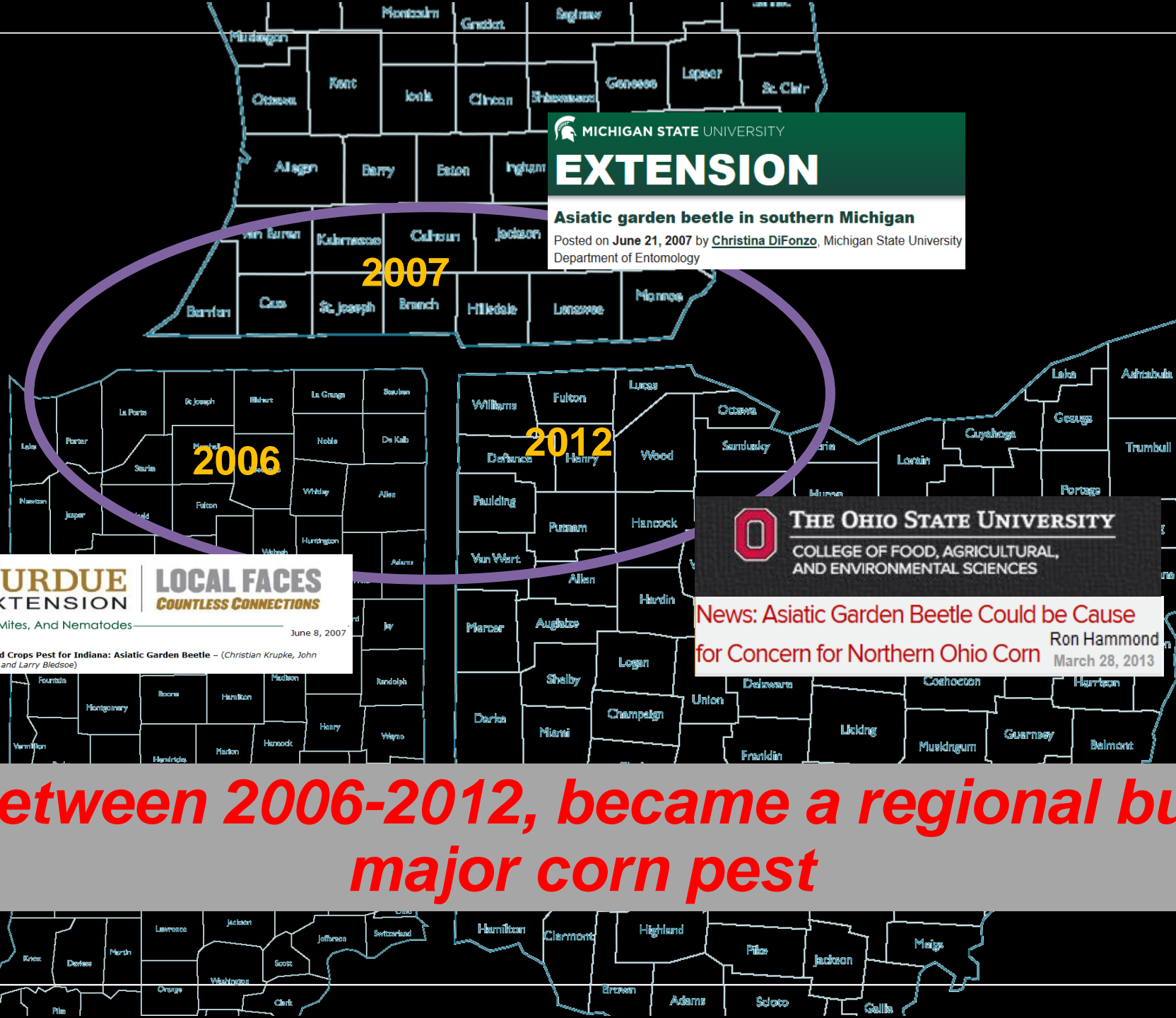
- Asiatic Garden Beetle
- Caterpillars in ears
- Bt resistance updates



# Update on Asiatic Garden Beetle

- Invasive white grub first found in NJ
- Now found in many parts of US
- Different from other white grubs





 MICHIGAN STATE UNIVERSITY  
**EXTENSION**  
**Asiatic garden beetle in southern Michigan**  
Posted on June 21, 2007 by [Christina DiFonzo](#), Michigan State University  
Department of Entomology

**PURDUE** LOCAL FACES  
EXTENSION COUNTLESS CONNECTIONS  
Insects, Mites, And Nematodes June 8, 2007  
A New Field Crops Pest for Indiana: Asiatic Garden Beetle – (Christian Krupke, John Obermeyer, and Larry Bledsoe)

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**News: Asiatic Garden Beetle Could be Cause  
for Concern for Northern Ohio Corn** Ron Hammond  
March 28, 2013

***Between 2006-2012, became a regional but  
major corn pest***



# ***AGB Damage on Corn-Ohio***



Amy Raudenbush



## ***AGB Damage in surrounding states***





***“Purpling” of corn a common symptom (but not always...)***







egg and 1<sup>st</sup> instar



2<sup>nd</sup> and 3<sup>rd</sup> instars

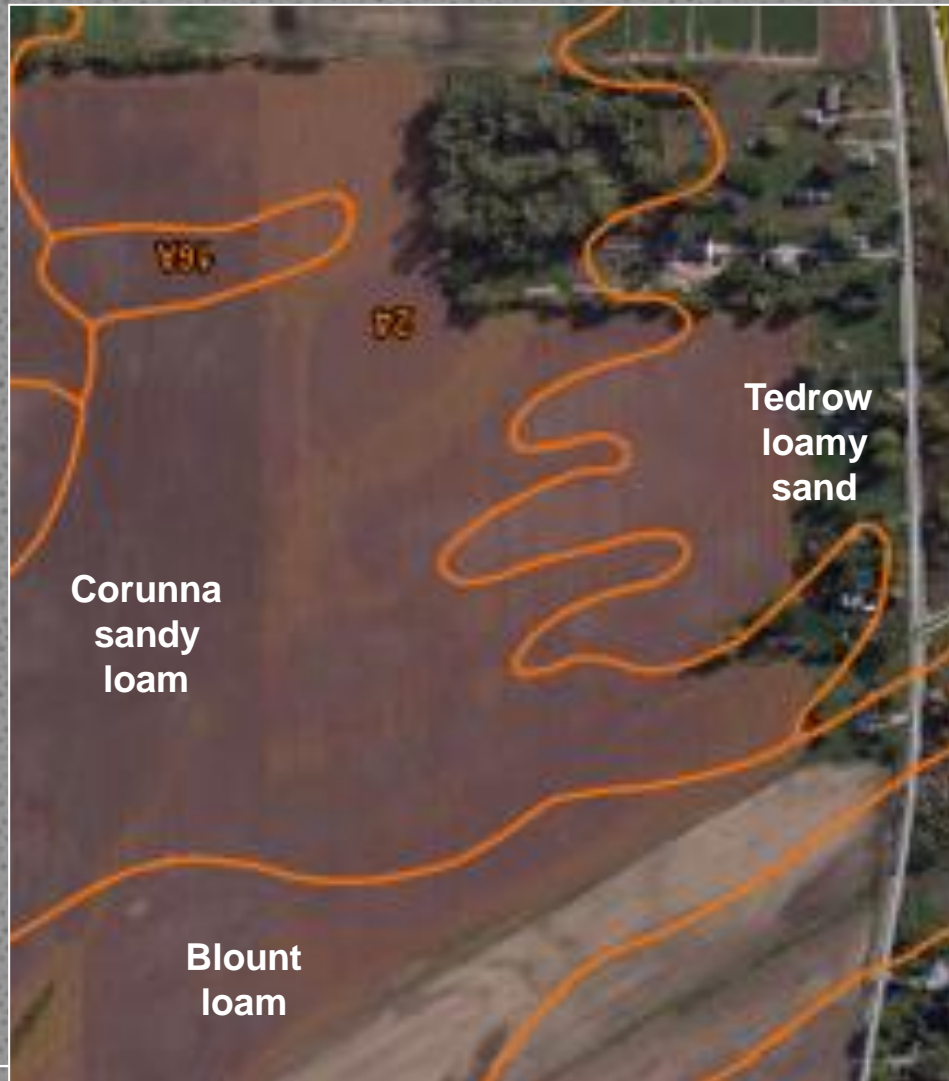


pupae and adults





# Asiatic Garden Beetle prefers sandy soils





# What to look for

- Stunted plants
- Plant stand loss (up to 40%+)
- Financial loss from re-planting
- Indirect yield loss from late replant timing





# AGB Management

- What doesn't work
  - Insecticidal seed treatments at any rate
    - Even high (1250) won't work with high pressure
  - Most in-furrow products at labelled rates
  - Tillage (only minor suppression)
- Maybe? Spraying soybean @ R3
  - Populations are not that predictable
  - Don't recommend



Bruce MacKellar, MSU



# AGB Management

- What does work
  - Chlorothoxyfos is **very effective** based on lab studies
  - Index (AMVAC) = chlorothoxyfos + bifenthrin liquid
  - SmartChoice (AMVAC) = chlorothoxyfos + bifenthrin granules
  - Even at lowest labelled rate





# When worms in ears are not earworms

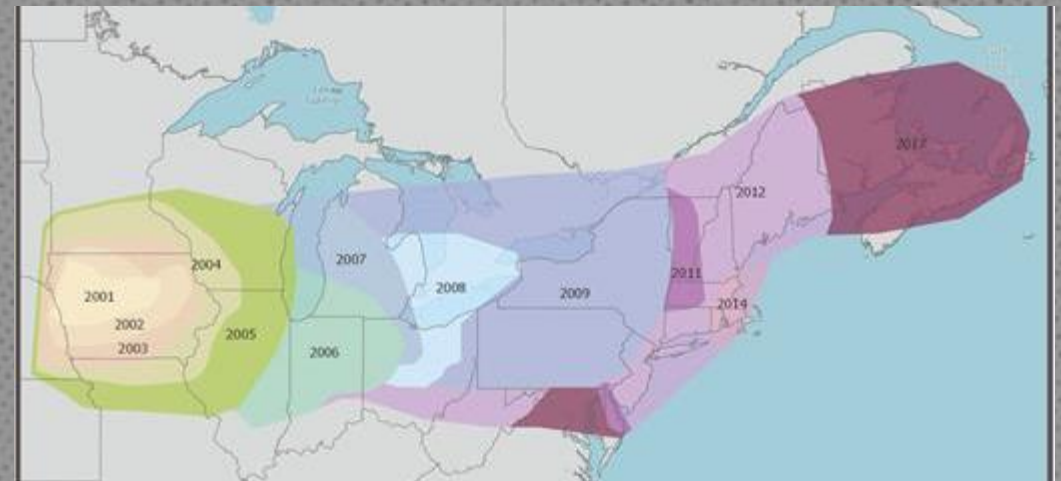
- Increasing ear feeding by caterpillars
- Western bean cutworm
- European corn borer
- Corn earworm





# Western bean cutworm

- Found in 2007, significant pest in 2014
- One generation/year
  - Fly June-Sept, mid July is peak





# Western bean cutworm

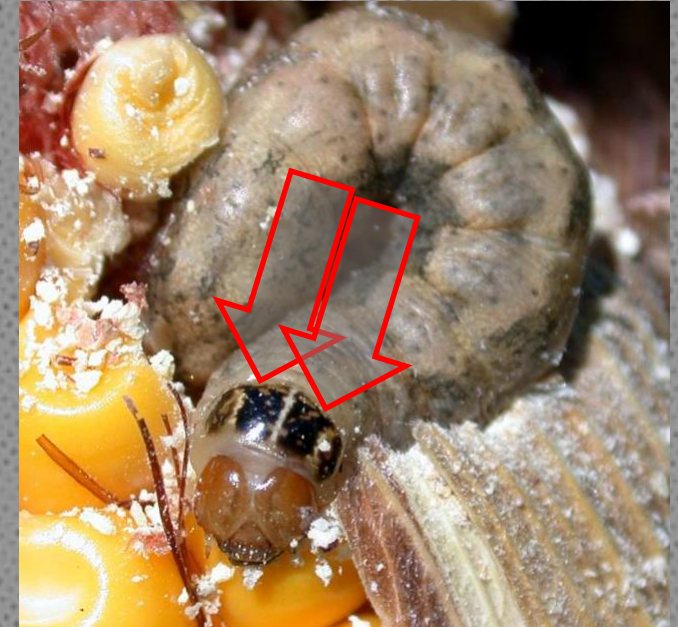
- Eggs laid from July until August
- Clumps of 25-100, 5-7 days
- Start white, then tan/pink, then purple
- Hatch w/in 24hrs when purple





# Western bean cutworm

- Later stages move to ear
- ID by 2 brown stripes
- Chew on silk and enter
- Enter through the side





# Western bean cutworm

- When >1 adults are caught/night—scout!
- Focus on pre-tassel corn
  - Females preference
- Eggs are laid on uppermost 2 leaves
- In vertical position



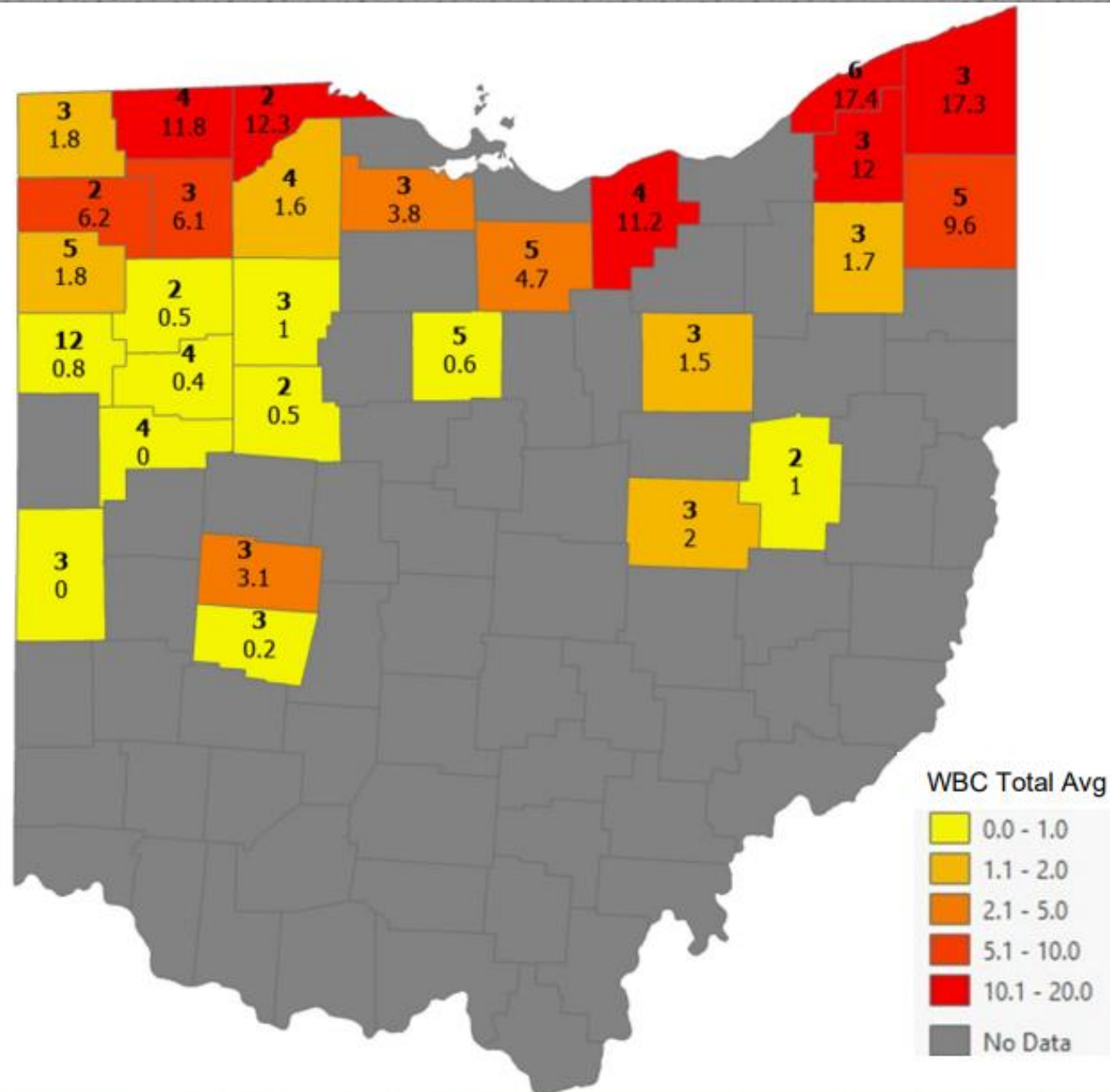


# Western bean cutworm

- Inspect 10 plants in 10 locations
  - Across rows, too
  - Check pre-tassel corn, replant areas
- If  $\geq 5\%$ -8% have egg mass, treatment necessary
- Spray after egg hatch, but before larvae enter ear
  - Watch for purpling, will have 24-48 hrs before hatch
  - Use products with good residuals







# 2021 Trapping Results



# Corn Earworm

- Fly July-Sept
- Heavier populations last few years
- Growing issue in sweet corn, emerging in field corn
- Migrates from southern US



Photos by John Obermeyer, Purdue University

## Corn earworm in traps

Year	Corn earworm trap trend	#moths/day at peak
2007	Very high, prolonged	388
2008	Low/Moderate	5
2009	High but quick	63
2010	Very high	270
2011	High but late	66
2012	Moderate	37
2013	Low/Moderate	5
2014	Moderate but late	15
2015	High but quick	53
2018	High, early	114

Data from Celeste Welty



# CEW Management in Field Corn

- Field corn
  - More difficult, but silking is still critical time
  - Trap for moth activity





# European Corn Borer

- Early foliar feeder
- Ear feeder later in season



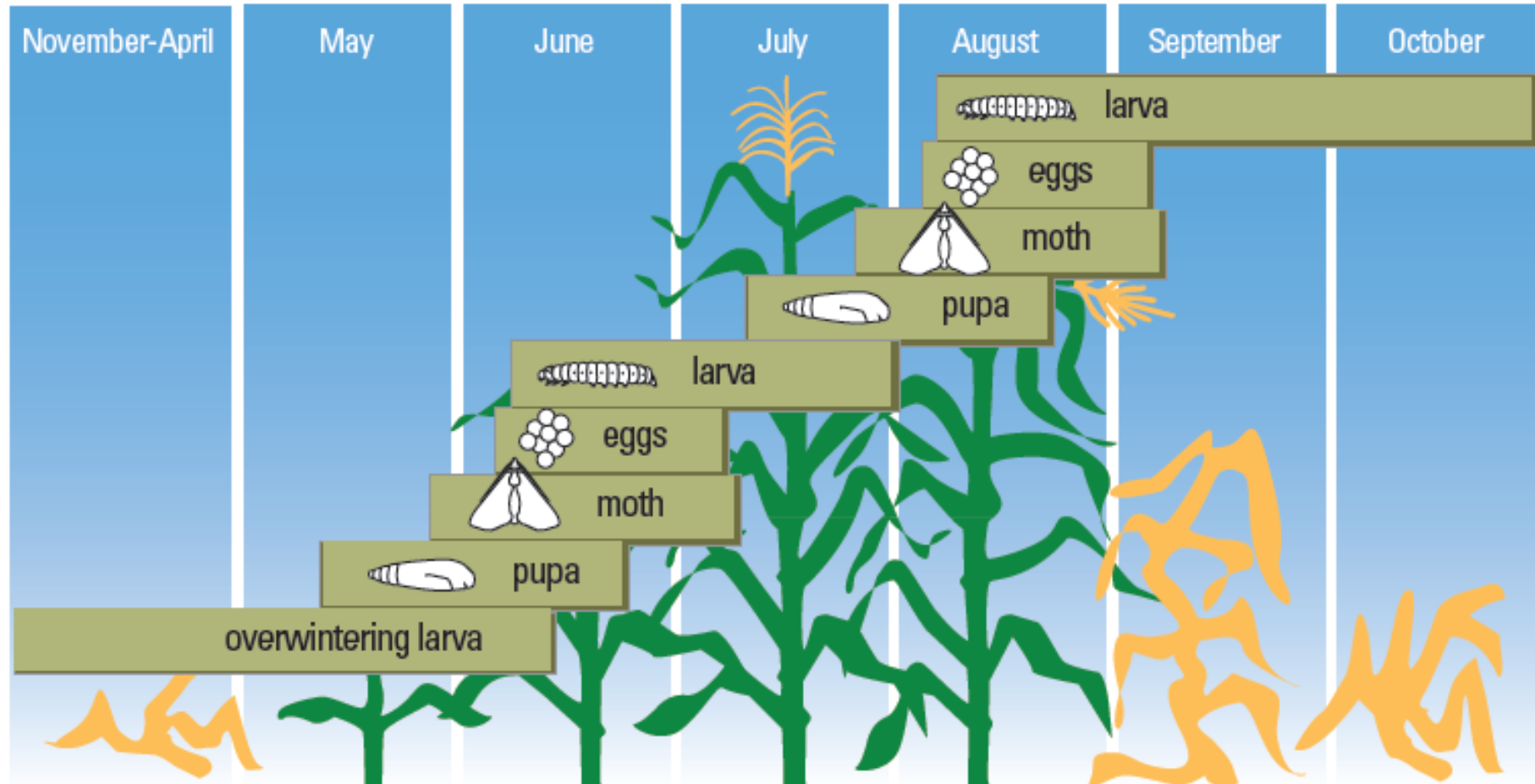
**CFAES**



# Timing of common corn caterpillars

ECB

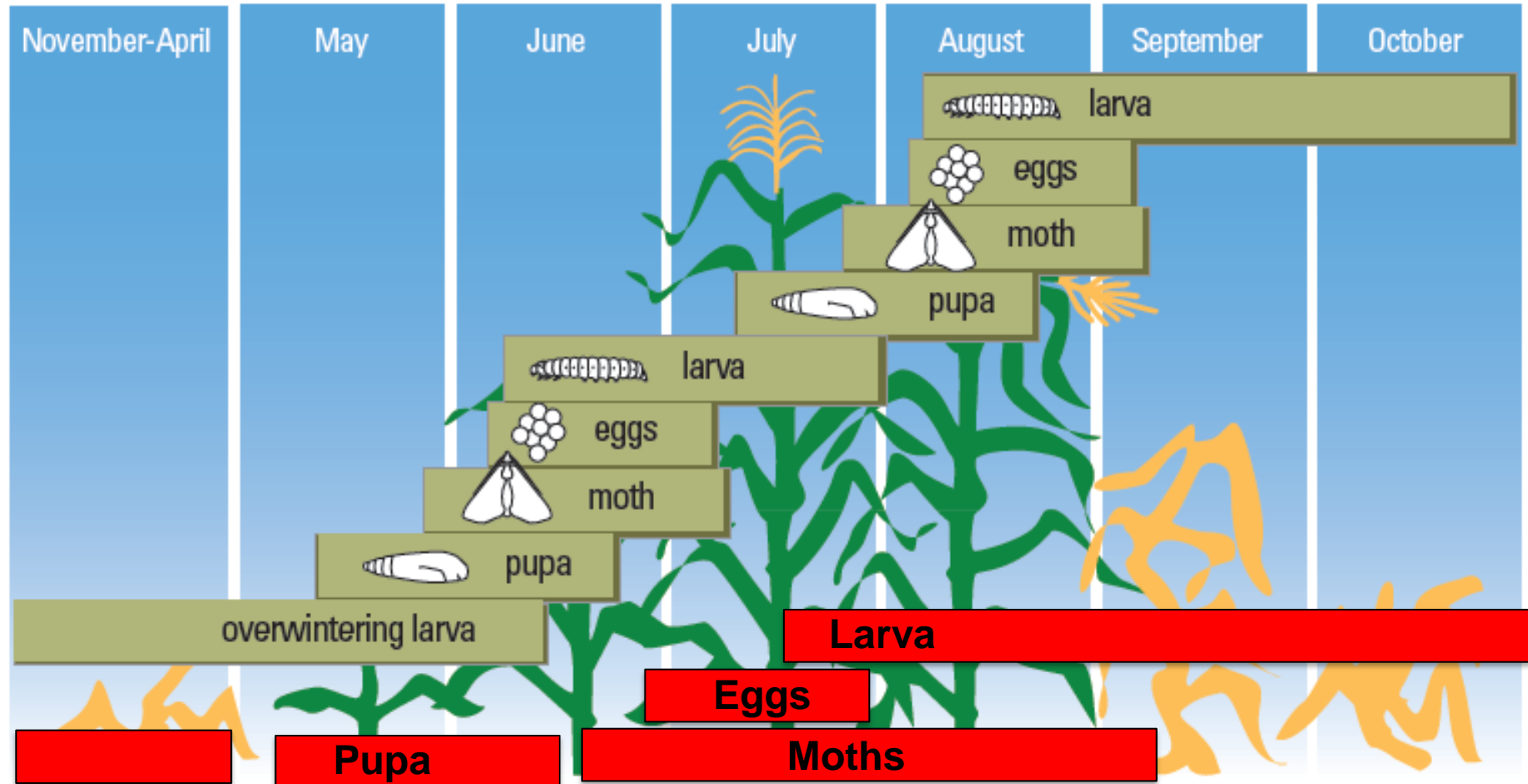
Figure 2. Typical life history of European corn borer in relationship to corn phenology—central Corn Belt of the United States.





# Timing of common corn caterpillars

Figure 2. Typical life history of European corn borer in relationship to corn phenology—central Corn Belt of the United States.

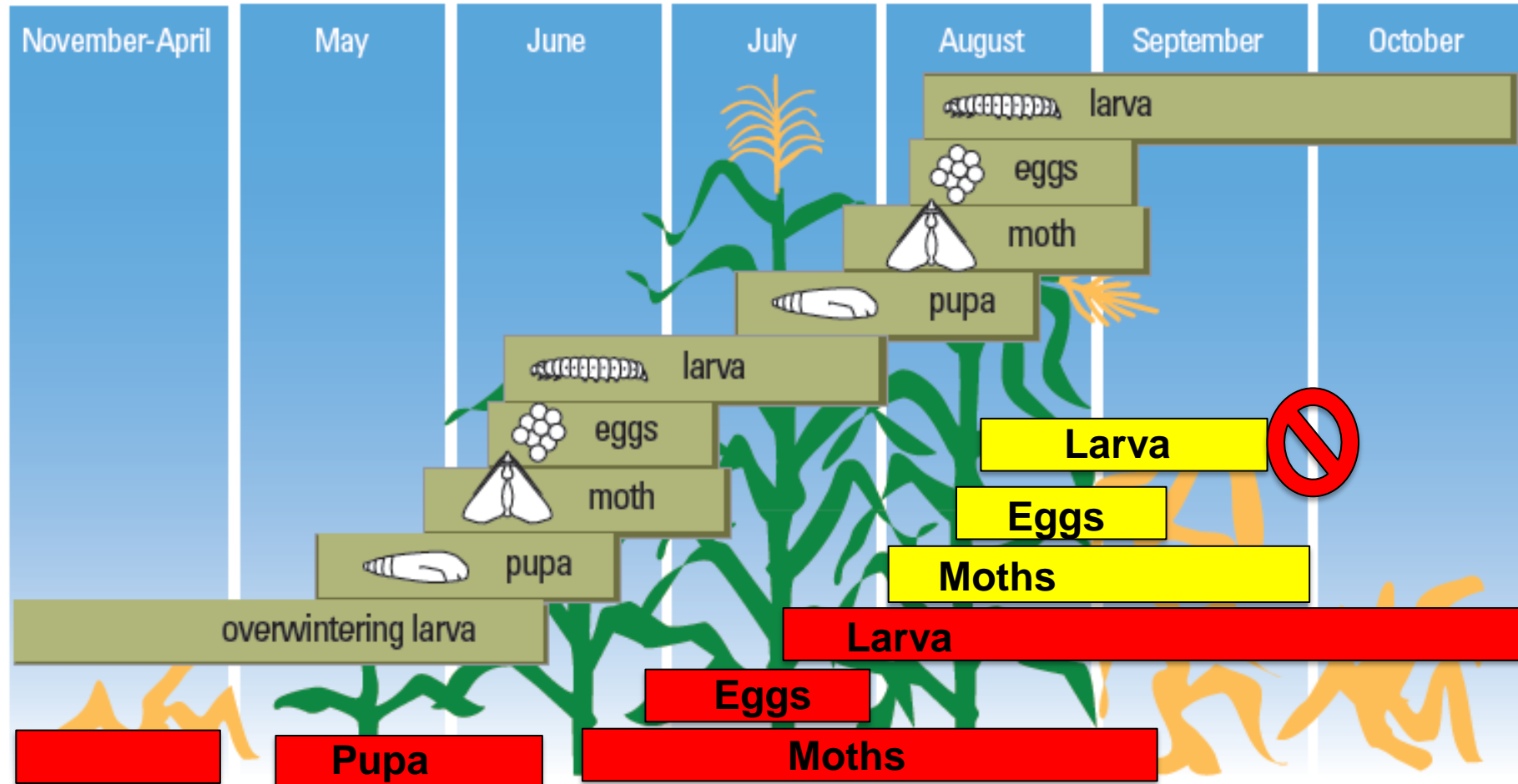


ECB  
WBC



# Timing of common corn caterpillars

Figure 2. Typical life history of European corn borer in relationship to corn phenology—central Corn Belt of the United States.





# Caterpillar ID--Eggs



WBC



CEW



ECB





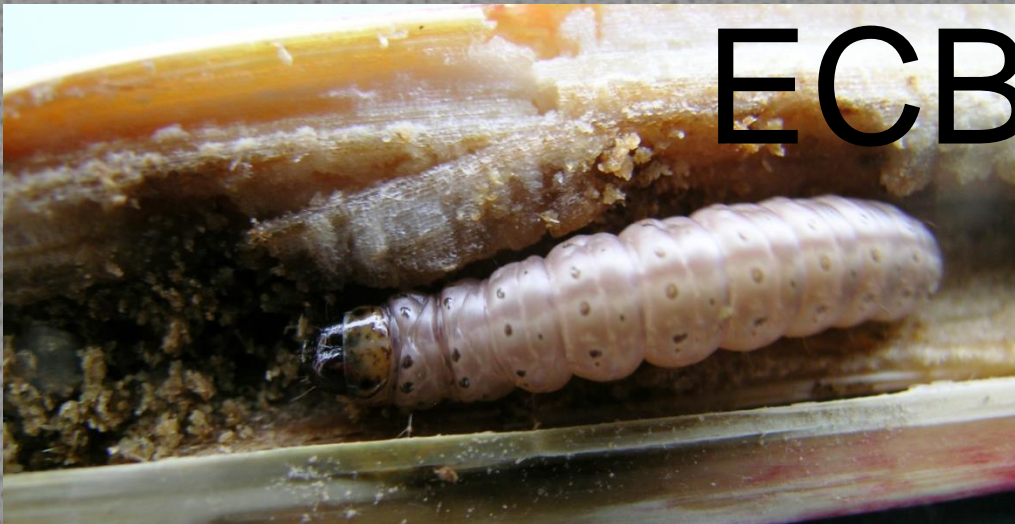
# Caterpillar ID--Larvae



CEW



WBC



ECB





# Caterpillar management

- Pheromone trap
  - Most are inexpensive and can tell you when moths are active
- Scout for eggs and larvae
  - Eggs more important because of short spray window
- Bt?





# Common Bt's for Caterpillars

- Cry1Ab: Old Yieldgard
- Cry1F: Old Herculex
- Cry1A.105 & Cry2Ab2: Double Pro
- Vip3A: Viptera
- Mostly in combination now
- Note: any Cry3's are used for beetles (rootworms...)





# Confusing? Look for Bt Trait Table

## The Handy Bt Trait Table

Updated 2 February 2023

### for U.S. Corn Production

#### Complied by

Chris DiFonzo

Michigan State University

#### Web site hosting by

Pat Porter

Texas A&M University

The most up-to-date version of this table plus related extension materials are free online at:

<https://www.texasinsects.org/bt-corn-trait-table.html>

Questions? Comments? Complaints? difonzo@msu.edu

The Handy Bt Trait Table provides a helpful list of trait packages to make it easier to understand seed guides, sales materials, and bag tags.

The big change for 2023: The table increased from one to two pages. Companies continue to recombine existing insect modes of action, rename trait stacks (as Syngenta did for 2023), and add Enlist technology (providing tolerance to 2,4-D and fops herbicides) to existing hybrid packages. Each new combination and new name increased the length of the table. The font size and spacing on the one-page version decreased to a point where it was too small. To remedy this, I flow the 2023 table over two pages. Where possible, the font size increased, and a new column was added for bag tag letter codes. For those who need it, the table of 'transformation events', on page 1 of previous tables, has moved online.

I am often asked why older trait packages, with limited or no commercial availability, remain on the table. This is for historical reference, so you can look back and interpret previous year's planting records, seed guides, and research results. Also, companies often refer to older trait stack names in current seed guides (e.g. 'AwesomeSeed's new XYZ Pro is a

#### ABBREVIATIONS in the TRAIT TABLE

##### Insect Pest Targets

BCW	black cutworm
CEW	corn earworm
CRW	corn rootworm
ECB	European corn borer
FAW	fall armyworm
NCR	northern corn rootworm
SB	stalk borer
SCB	sugarcane borer
SWCB	southwestern corn borer
TAW	true armyworm
WBC	western bean cutworm
WCR	western corn rootworm

##### Herbicide Tolerance

GLY	glyphosate / Roundup-Ready
LL	glufosinate / Liberty Link
2,4D	2,4-D

[https://www.texasinsects.org/uploads/4/9/3/0/49304017/bttraittable\\_feb\\_2023.pdf](https://www.texasinsects.org/uploads/4/9/3/0/49304017/bttraittable_feb_2023.pdf)

By Pat Porter (Texas A&M) and Chris DiFonzo (MichSt)



# Confusing? Look for Bt Trait Table

Trait packages, listed A-Z = former name if applicable	Bag- tag Code	Toxins in package *****  Font type denotes target: caterpillar or <i>rootworm</i>	Marketed to control:											Resistance cases for all Bts in package	Non-Bt refuge cornbelt	Herbicide tolerance
			B C W	C E W	E C B	F A W	S C B	S W C B	T A W	W B C	C R W					
AcreMax	AM	Cry1Ab - Cry1F	x	x	x	x	x	x	x				CEW FAW WBC	5% in bag	GLY LL	
AcreMax CRW	AMRW	<i>Cry34Ab1 - Cry35Ab1</i>										x	NCR WCR	10% in bag	GLY LL	
AcreMax1	AM1	Cry1F - <i>Cry34Ab1 - Cry35Ab1</i>	x		x	x	x	x	x			x	ECB FAW NCR SWCB WBC WCR	10% in bag 20% ECB	GLY LL	
AcreMax Leptra	AML	Cry1Ab - Cry1F - Vip3A	x	x	x	x	x	x	x	x	x			5% in bag	GLY LL	
AcreMax TRIsect	AMT	Cry1Ab - Cry1F - <i>mCry3A</i>	x	x	x	x	x	x	x			x	CEW FAW WBC WCR	10% in bag	GLY LL	
AcreMax Xtra	AMX	Cry1Ab - Cry1F - <i>Cry34Ab1 - Cry35Ab1</i>	x	x	x	x	x	x	x			x	CEW FAW NCR WBC WCR	10% in bag	GLY LL	
AcreMax Xtreme	AMXT	Cry1Ab - Cry1F - <i>Cry34Ab1 - Cry35Ab1 - mCry3A</i>	x	x	x	x	x	x	x			x	CEW FAW WBC WCR	5% in bag	GLY LL	
Agrisure 3010	3010	Cry1Ab		x	x			x	x				CEW	20%	GLY LL	
Agrisure 3000 GT & 3011A	3000GT 3011A	Cry1Ab - <i>mCry3A</i>		x	x			x	x			x	CEW WCR	20%	GLY LL	
Agrisure Above = Agrisure 3120EZ	AA	Cry1Ab - Cry1F	x	x	x	x	x	x	x				CEW FAW WBC	5% in bag	GLY LL - check bag	
Agrisure Total = Agrisure 3122EZ	AT	Cry1Ab - Cry1F - <i>Cry34Ab1 - Cry35Ab1 - mCry3A</i>	x	x	x	x	x	x	x			x	CEW FAW WBC WCR	5% in bag	GLY LL - check bag	
Agrisure Viptera 3110	3110	Cry1Ab - Vip3A	x	x	x	x	x	x	x	x	x			20%	GLY LL	
Agrisure Viptera 3111	3111	Cry1Ab - Vip3A - <i>mCry3A</i>	x	x	x	x	x	x	x	x	x	x	WCR	20%	GLY LL	

[https://www.texasinsects.org/uploads/4/9/3/0/49304017/bttraittable\\_feb\\_2023.pdf](https://www.texasinsects.org/uploads/4/9/3/0/49304017/bttraittable_feb_2023.pdf)

By Pat Porter (Texas A&M) and Chris DiFonzo (MichSt)



# WBC resistance to Cry1F

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- Cry1F used to offer excellent to good control of WBC
- Since ~2014, issues with resistance
- Do not recommend for Ohio
- Only Vip3A works against WBC





# Corn Earworm Resistance

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- First found around eastern shore, documented in Ohio in 2019 (Wayne County)
- Resistance to Cry1A.105 & Cry2Ab2
- Cry1F & Cry1Ab doesn't work naturally
- Only recommend Vip3A

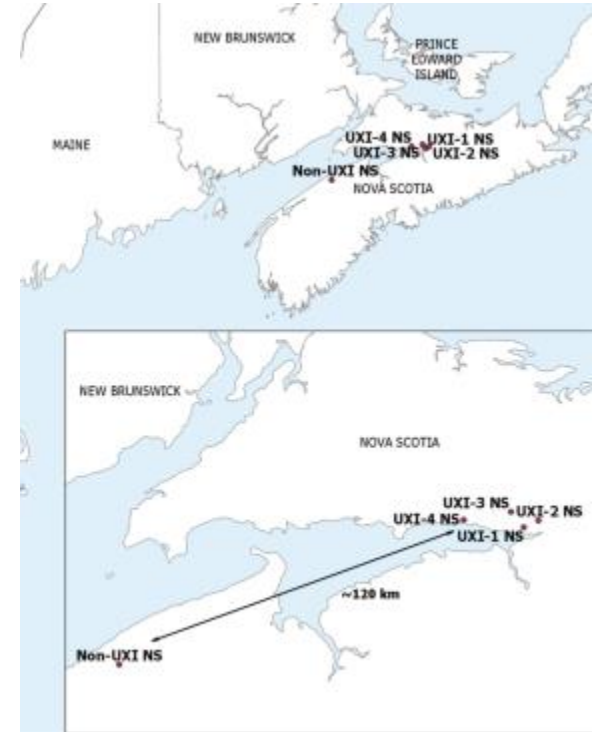




# ECB resistance to Cry1F

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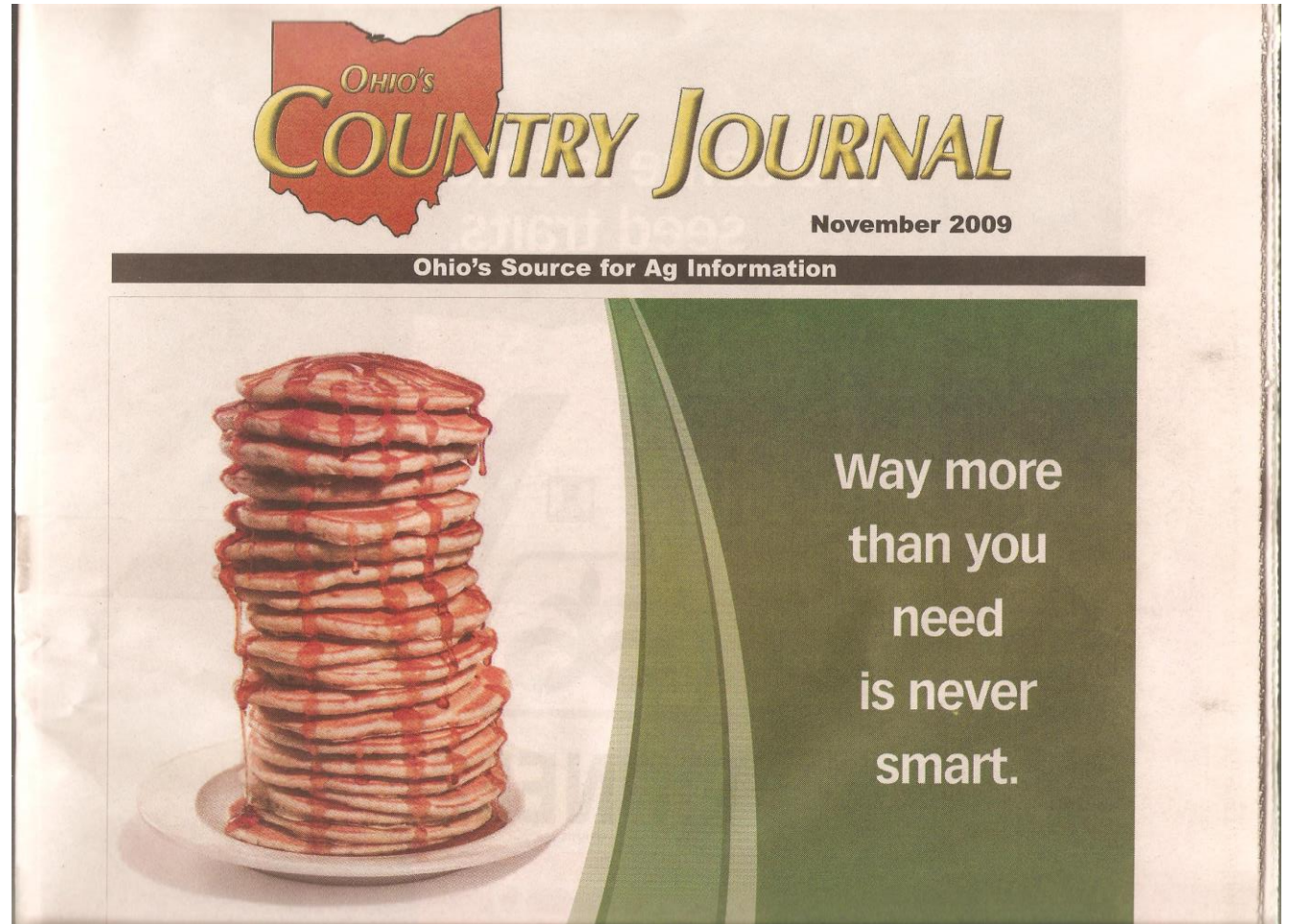
- European Corn Borer
  - Cry1F resistance in Nova Scotia (2018)
  - Other parts of Canada?
- VIP doesn't work, so only other Cry's work (Cry1Ab, Cry1A.105 & Cry2Ab2)
- Concern for Ohio?





# Managing Bt resistance in Ohio

- Promote stewardship
  - Do you need the traits?
  - Rotate traits
  - Handy Bt trait table
  - Plant non-Bt as a learning process
    - Corn performance trials





# Which Bts Work for Ohio

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- **Rootworm—everything, as far as we know**
  - Not the case out west
- European Corn Borer—everything, as far as we know (except VIP)
- Corn Earworm—only traits with VIP
- Western Bean Cutworm—only traits with VIP



# Managing Bt resistance in Ohio

- Scout for UXD/UXI
  - This is the new threshold for resistance
  - Consider Bt strip tests to distinguish refuge
  - Know your traits (Bt table)





CFAES COVID-19 Resources: Safe and Healthy Buckeyes | COVID-19 Hub | CFAES Calendar

# Agronomic Crops Insects

College of Food, Agricultural, and Environmental Sciences

**CFAES** Home Ag Insect Team News Extension Publications Bt Corn Trait Table Pest Monitoring Reports

**WELCOME TO THE AGRONOMIC CROP INSECT PEST WEBSITE!**

The Ag Insects Team is a collaboration between the Tilmon and Michel Labs at Ohio State University (OARDC campus). One of...

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**Student Spotlight**  
JAN 21, 2021  
We want to formally introduce the newest Graduate Student member of the

[aginsects.osu.edu/home](https://aginsects.osu.edu/home)



Dr. Kelley Tilmon, Amy Raudenbush, Adrian Pekarcik, Cindy Wallace

**CFAES**

**Thank You!**