

Corn Insect Pests in Nebraska

Débora Montezano¹, Kyle Koch² and Justin McMechan³

¹Postdoctoral Research Associate

²Assistant Extension Educator

³Research and Extension Entomologist

Email: dmontezano2@unl.edu

Twitter: @DeiaMontezano @justinmcmecan @KyleKochUNL



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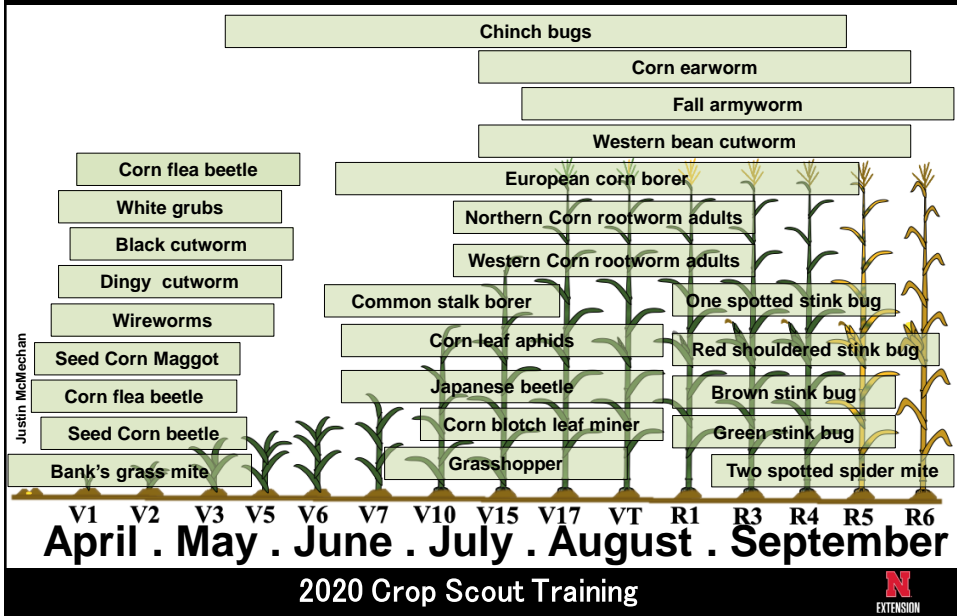
Overview

- Insects corn pests in Nebraska overview
- Focus on key insect pest in Nebraska
 - Identification
 - Time of occurrence/Life Cycle
 - Distribution
 - Injury caused
 - Scouting
 - Management
 - Current status

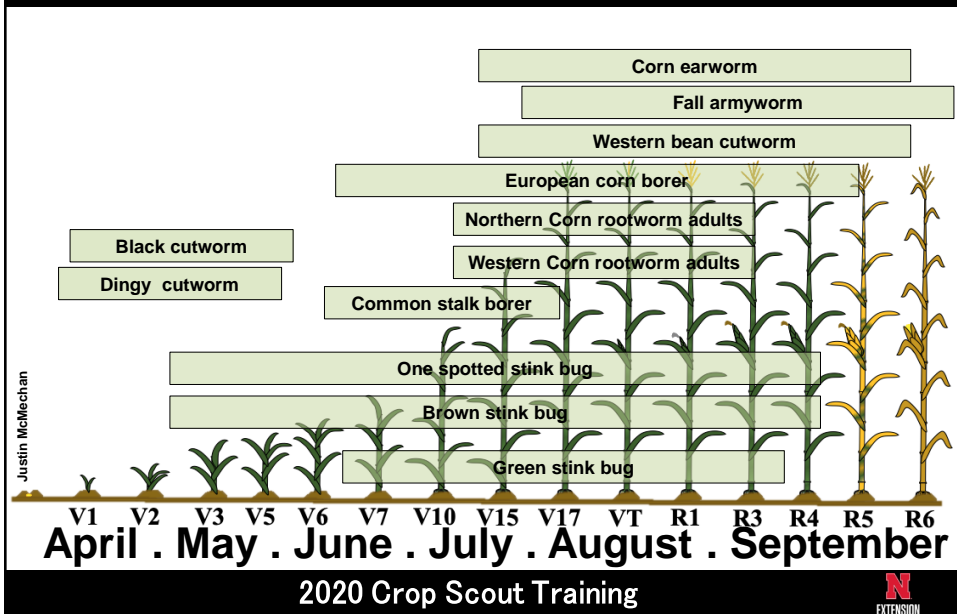
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Insect corn pest Nebraska

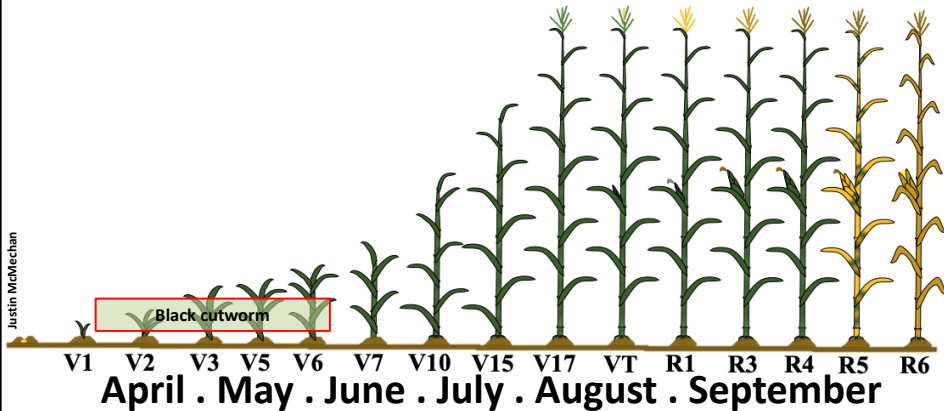


Insect corn pest Nebraska



Black cutworm - Occurrence

Season: April to early June - From emergence to V8



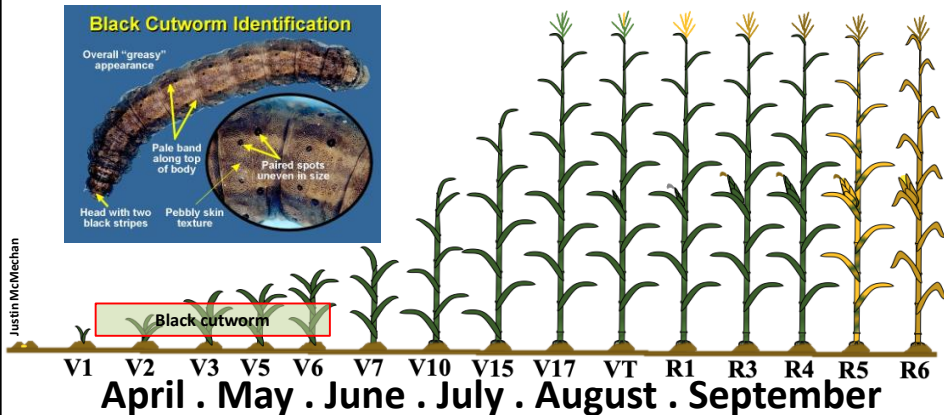
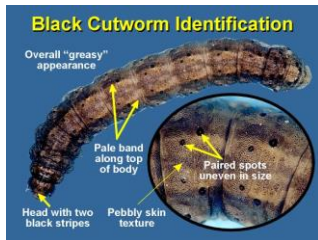
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Black cutworm - Occurrence

Season: April to early June - From emergence to V8

Two generation a year, only first one cause damage

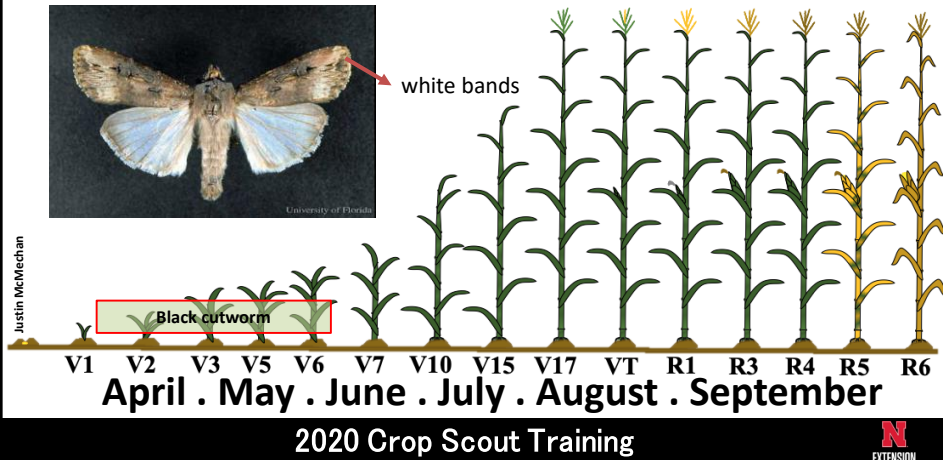


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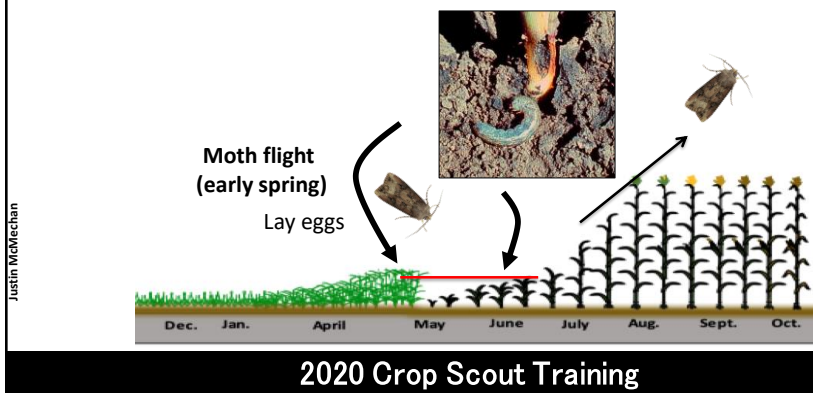
Black cutworm - Occurrence

Season: April to early June - From emergence to V8
Migrate from South – Does not overwinter in NE



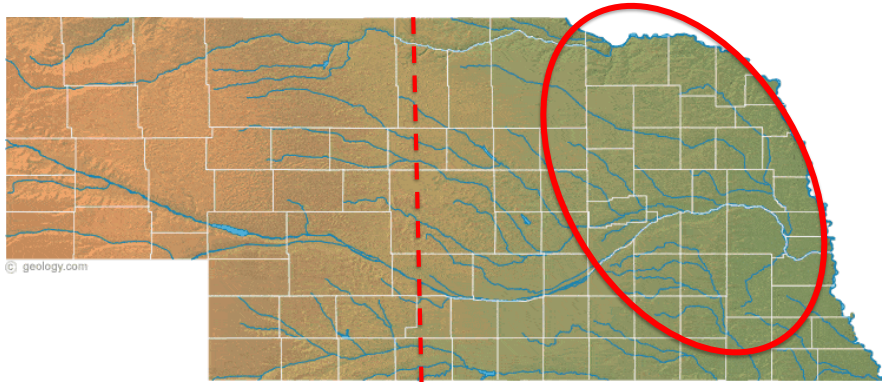
Black cutworm – Life cycle

- April to May – Arrive from South
- Mid April to May – Lay eggs
- **Late April to Mid June – Larvae**
- Late May to early July – Pupae
- Early July to Mid August – 2nd generation



Black cutworm - Distribution

Eastern Nebraska, but are found west of the 100th meridian, which runs through Dawson County



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Black cutworm – Plant Injury

- Early stages “Shot holes”
- Later stages cut plants or burrow into base of plants
- Drilling into V6-V8 stage plants can kill growing point
- Look at base for cutting
 - Cutting mostly above ground in wet soil, mostly below ground in dry soil

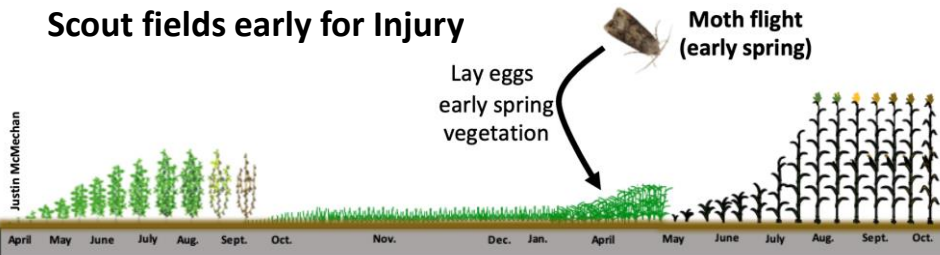


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Black cutworm Scouting Management

Scout fields early for Injury



Scouting Corn:

- Leaf damage
 - Cut stalks
 - Wilted plants
- 3-5% damaged

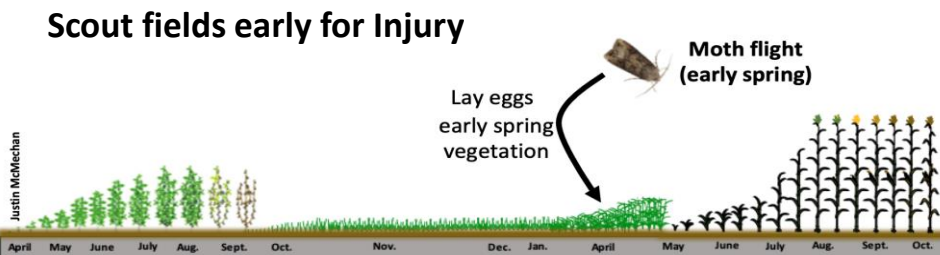


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Black cutworm Scouting Management

Scout fields early for Injury



- **Early detection is essential**
- **Treat if damage exceeds the threshold**
- **Post emergence rescue treatment recommended**
- **Cutworms are 1 inch or less in length**
 - longer than 1 inch likely are to pupate

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Black cutworm – Field Conditions

Cutworms can occur in any corn field:

- Corn following soybeans that had an abundance of winter annual or perennial weeds
- Fields with heavy vegetative cover during the early spring
- Fields planted into sod or legume pastures
- Tillage practices that allow plant residues or weeds to remain in spring

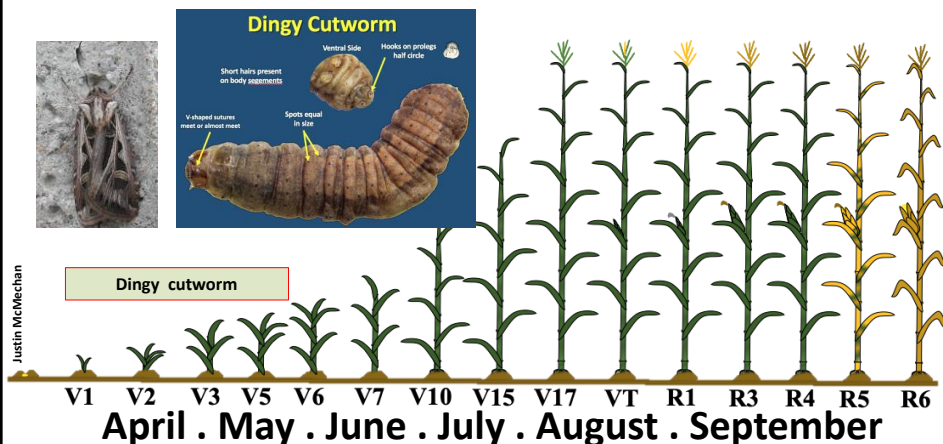
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Dingy cutworm - Occurrence

Overwinters in Nebraska

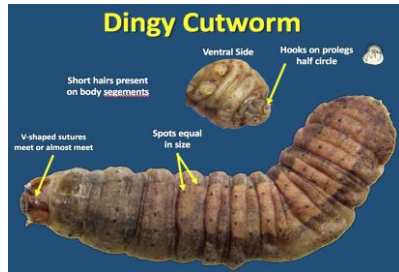
Usually the first to damage corn in the spring.



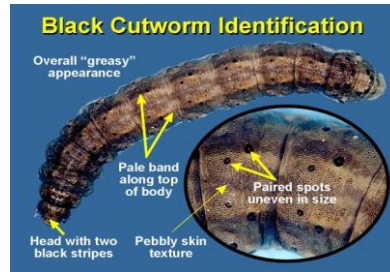
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Cutworms - Differences



- 1 - Overwinter as small larva in Nebraska
- 2 - Many crops (flooded and weedy areas)
- 3 - Cause less damage than black cutworms
- 4 - Feed primarily on leaves



- 1 - Migrates to NE
- 2 - Many crops (flooded and weedy areas)
- 3 - Cause more damage than dingy cutworms
- 4 - Feed on leaves and cut stems

In most cases, **treatment for dingy cutworms is not justified** unless extensive feeding accompanies poor growing conditions

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Ear Feeding Lepidopteran

There are four lepidopteran pests that you may encounter feeding on corn ears in NE:

1. European corn borer (*Ostrinia nubilalis*)
2. Western bean cutworm (*Striacosta albicosta*)
3. Corn earworm (*Helicoverpa zea*)
4. Fall armyworm (*Spodoptera frugiperda*)

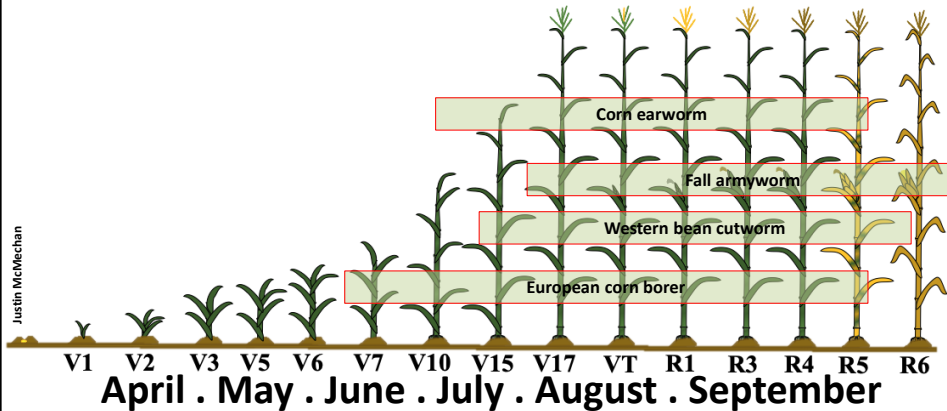


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Ear Feeding Lepidopteran - Occurrence

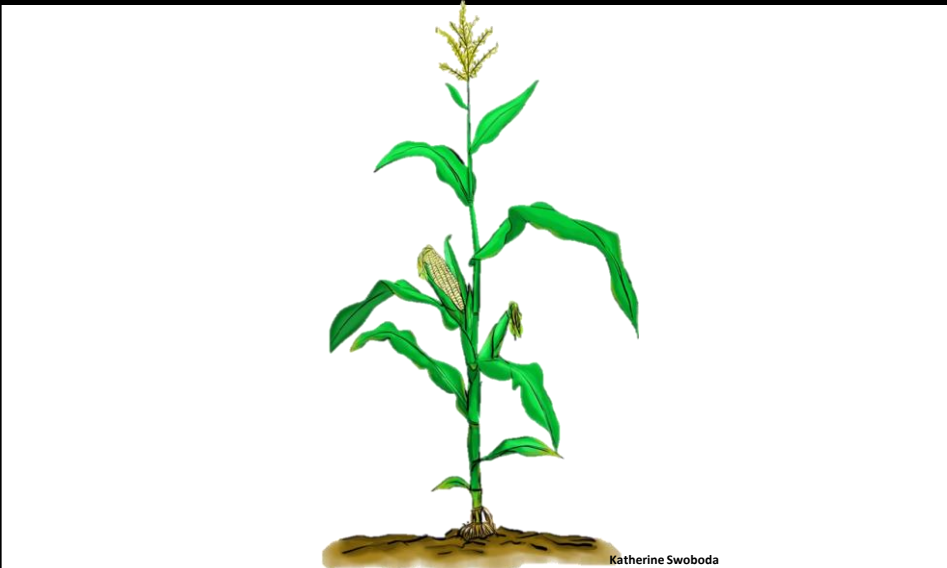
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Ear Feeding Lepidopteran – Egg placement on plant

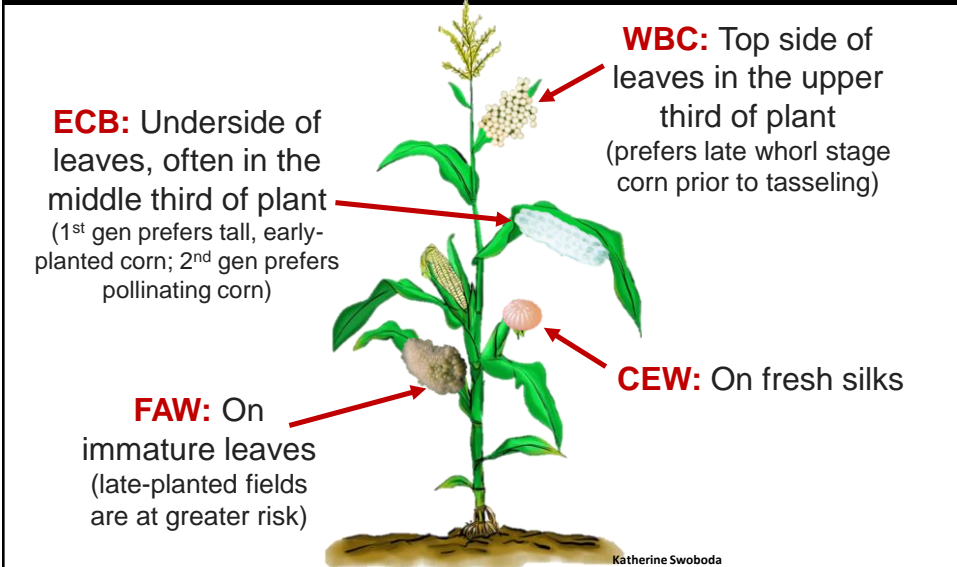


Katherine Swoboda

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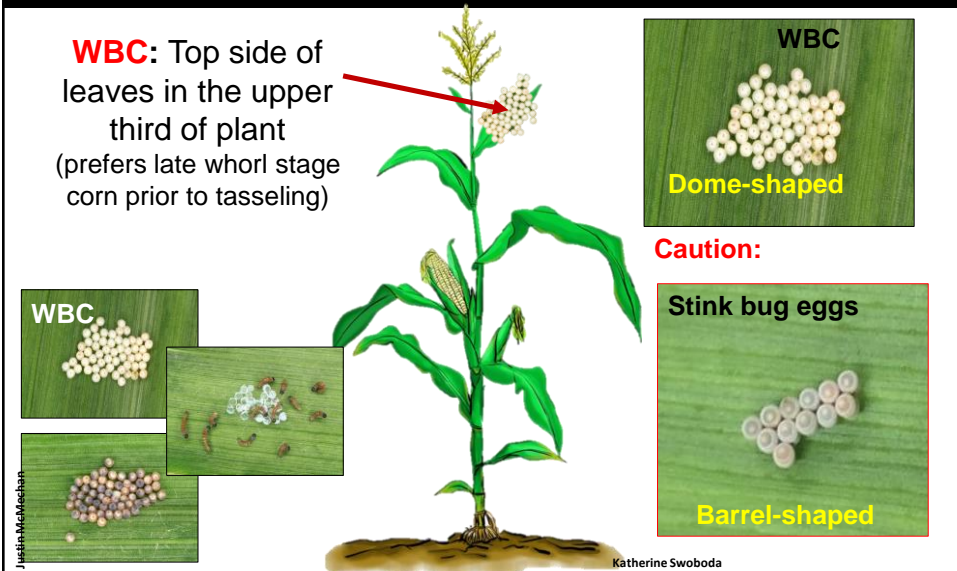
Ear Feeding Lepidopteran – Egg placement on plant



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Ear Feeding Lepidopteran – Egg placement on plant



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Ear Feeding Lepidopteran – Life cycle

	Overwintering behavior	Generations per year in NE
ECB	Overwinters as larvae in corn stalks and pupates in the Spring	2 *Can have >2 in warmer climates
WBC	Overwinters as pre-pupae in the soil	1
CEW	Overwinters as pupae in the soil, but not in NE. Migrates from south each year	2 *Can have >2 in warmer climates
FAW	Same as CEW	2 *Can have >2 in warmer climates

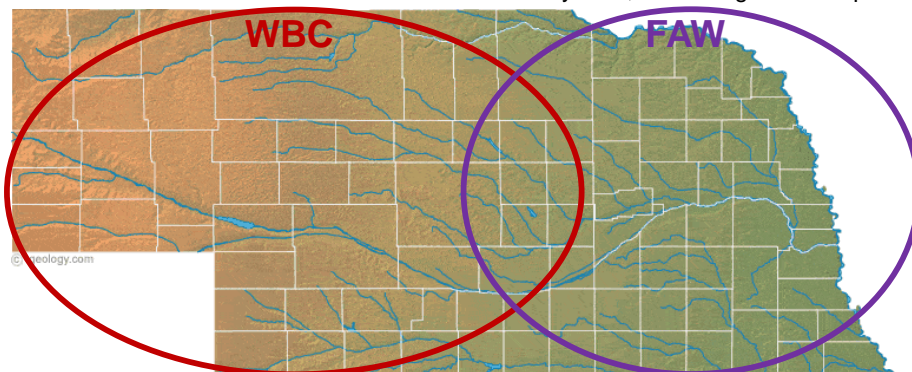
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Ear Feeding Lepidopteran – Distribution

ECB: *Statewide*, anywhere corn is grown; wide host range, also attacks other corn varieties

CEW: *Statewide*; wide host range, also attacks other corns, sorghum, soybean, fruit & vegetable crops



WBC: *Statewide*, but most common in central and western regions in areas with continuous corn or sandy soils; also attacks dry beans









FAW: *Statewide*, but most common in the east; wide host range, also attacks other corns & sorghum

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Ear Feeding Lepidopteran – Injury Symptoms

<p>ECB</p> <ul style="list-style-type: none"> — 1st gen: Whorls and surrounding leaves with a “shot-hole” appearance — 2nd gen: Ear shanks, stalks, and cobs with feeding damage and entry holes 	<p>CEW</p> <ul style="list-style-type: none"> — 1st gen: Defoliation — 2nd gen: Damaged ears, usually contain one larva
<p>WBC</p> <ul style="list-style-type: none"> — Ears, may contain multiple larvae, side entry holes, and secondary fungal infection 	<p>FAW</p> <ul style="list-style-type: none"> — 1st gen: Damaged whorls, defoliation, and stunting — 2nd gen: Damaged ears, side entry holes and potential secondary fungal infection



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Billy Wiseman, USDA-AFS, Rowwood.org

Ear Feeding Lepidopteran – ECB Scouting

<p>1st gen:</p> <ul style="list-style-type: none"> Begin scouting during the moth flight, egg-laying, and early hatching period 20 to 25 corn whorls, 4 locations in each field <u>Percentage of damaged plants</u> and the number of live larvae Average number of <u>live larvae per damaged plant</u> 	<p>2nd gen:</p> <ul style="list-style-type: none"> Begin scouting when second moth flight appears, green silks & shedding pollen fields 10 plants, 5 locations in each field, count egg masses <u>Economic threshold of 25-50% of plants with an egg mass</u> is exceeded and corn is at blister stage or earlier <p style="color: orange; font-weight: bold; margin-top: 20px;"> 1st gen ECB scouting spreadsheet; <i>Extension Circular 3018</i> </p> <p style="color: orange; font-weight: bold;"> 2nd gen ECB scouting spreadsheet; <i>Extension Circular 1584</i> </p>
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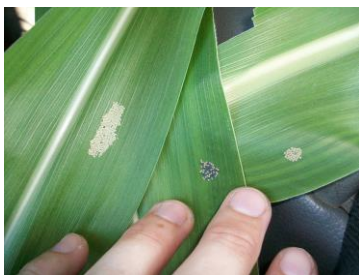
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1st gen ECB scouting spreadsheet; Extension Circular 3018
2nd gen ECB scouting spreadsheet; Extension Circular 1584

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Ear Feeding Lepidopteran – WBC Scouting



- 10 plants in 5 or more parts of each field
- Examine surface of top corn leaves for egg masses and the tassel, leaf axils, and ear tips for young larvae
- Treatment is recommended if 5-8% of plants are infested with eggs or larvae and if corn is at least 95% tasseled
- If corn is at milk stage before eggs are laid, no treatment is needed

WBC Speed Scouting app is available

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Ear Feeding Lepidopteran – CWE/FAW Scouting

CEW

- Examine silks for eggs and eartips for small larvae during the green silking period
- Treatment is not usually economically justified for field corn
- Seed corn, popcorn and sweet corn may require treatment



FAW

- Scout late-planted fields as they reach V5-V8
- Select 20 consecutive plants in a row in 4 locations, look for live larvae
- Thresholds are based on levels defoliation and the potential for larvae to enter the ear



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Ear Feeding Lepidopteran

Management Recommendations

	Bt Traits	Important Considerations
ECB	Cry1Ab, VIP3A, Cry1F, Cry1A.105, & Cry2Ab2 *Consider planting locally-adapted, high-yielding varieties with ECB resistance	1. Consult appropriate NebGuides when deciding to treat for either generation
WBC	VIP3A or Cry1F* traits *Note that the efficacy of Cry1F has decreased in some areas	1. Scout Cry1F fields if reduced efficacy has been observed in the area (e.g., SW & central NE) 2. Consider treating if thresholds are exceeded
CEW	VIP3A, Cry1F, Cry1A.105, & Cry2Ab2	
FAW	VIP3A, Cry1F, Cry1A.105, & Cry2Ab2	

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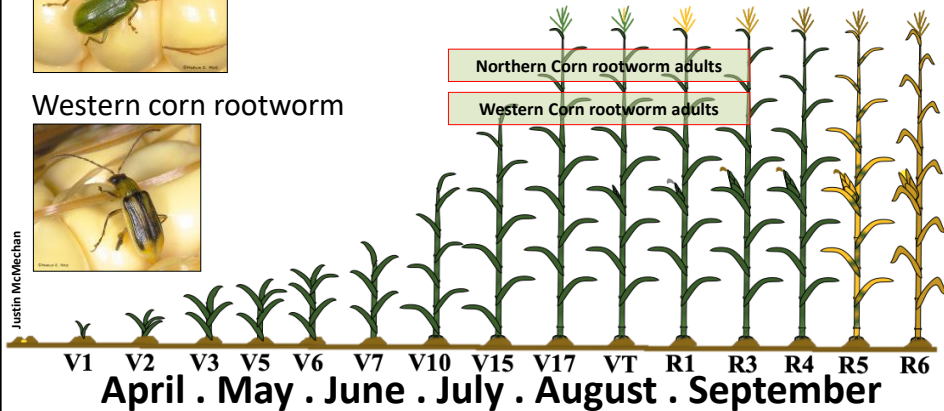


Corn rootworms - Occurrence

Northern corn rootworm



Western corn rootworm



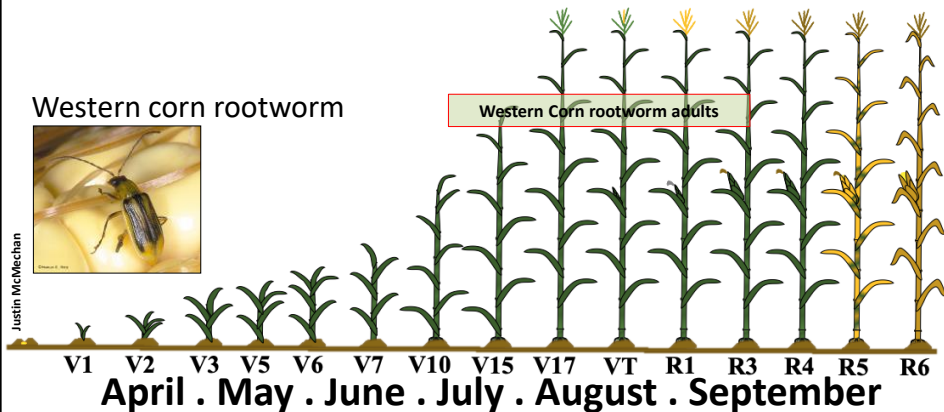
April . May . June . July . August . September

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Corn rootworms - Occurrence

Western corn rootworm

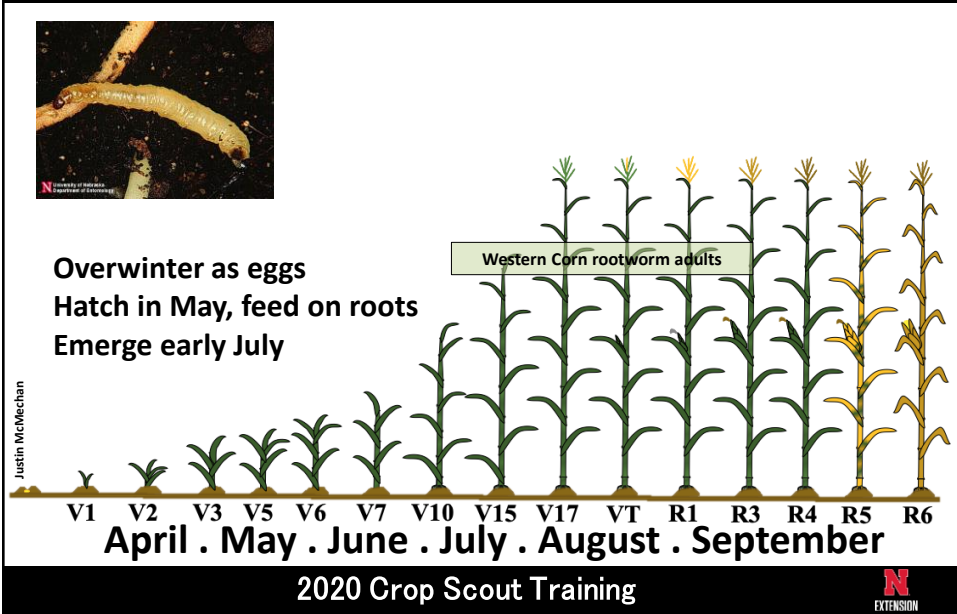


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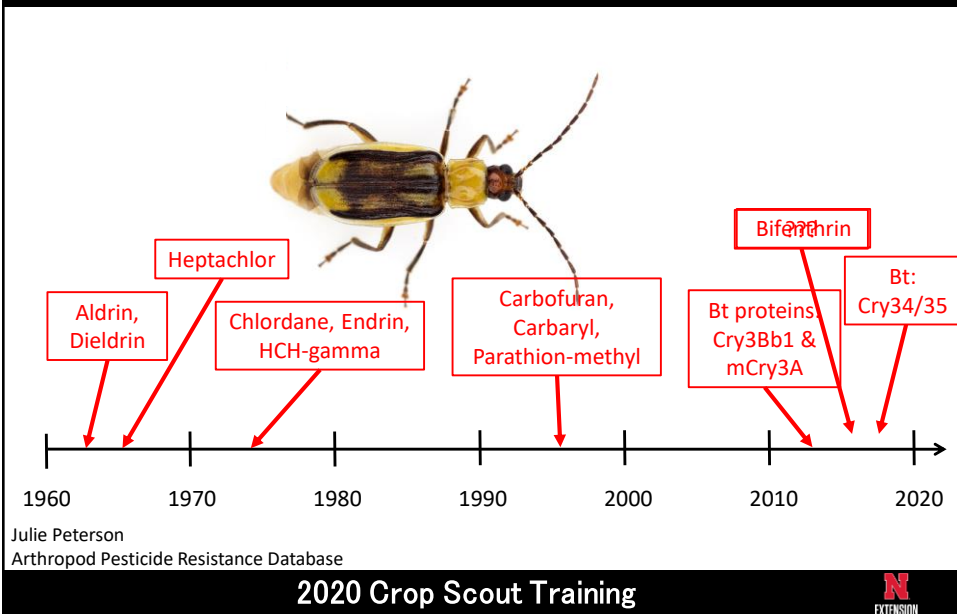
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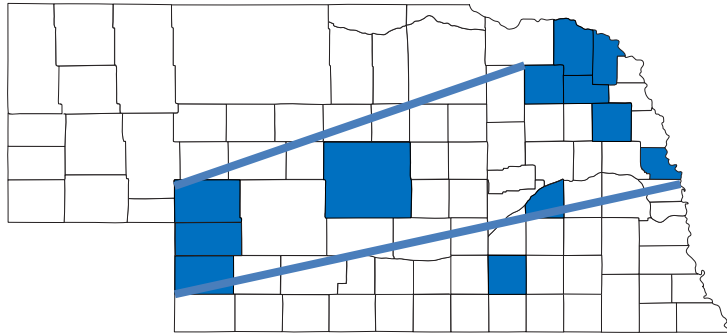
Corn rootworms - Occurrence



WCR Resistance in Nebraska



Confirmed WCR Resistance to Cry3Bb1



Some level of WCR resistance to Cry3Bb1 and cross-resistance to mCry3A detected from one or more fields per shaded county in UNL lab bioassays.

Wangila and Meinke 2011-2015.

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Bt Resistance: Nebraska Situation

- Greater than expected corn rootworm injury (NIS >1) in Cry3Bb1 fields during 2011-2015
 - Initially Northeast & Southwest NE
 - More recently, Central NE also
- Cry34/35 still works well in most of NE, but problem fields do exist



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So, how do we manage rootworm?

- This is not a “what is the best single trait or insecticide” situation.
- A rootworm management solution is required that incorporates IPM and IRM principles.
 - Refuge compliance, field scouting, long-term planning, using knowledge of the region and field history to make decisions
- Use of multiple tactics and rotation of tactics is key to slowing resistance.
 - Crop rotation, planting effective Bt traits, cautious use of insecticides for adult or larval control, biological control

Goal: Limit rootworm economic injury & limit the evolution of resistance

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Corn Rootworm-Targeting Bt Proteins

Cry3Bb1	
Cry34/35Ab1	
mCry3Aa	
Cry3Bb1 x Cry34/35Ab1	
mCry3Aa x Cry34/35Ab1	
mCry3Aa x eCry3.1Ab	

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Managing Resistance

- Cry3Bb1 problem field previous years
 - What should I plant this year?
- Go to your Handy Bt Trait Table

The Handy Bt Trait Table for U.S. Corn Production

Updated February 2020

The newest version of the table is posted at <https://www.texasinsects.org/bt-corn-trait-table.html>
 Editor: Chris Difonzo, Michigan State University, difonzo@msu.edu Web host: Pat Porter, Texas A&M University

The Handy Bt Trait Table provides a helpful list of trait names (below) and details of trait packages (over) to make it easier to understand company seed guides, sales materials, and bag tags.

At the end of 2018, European corn borer (ECB) damage to Cry3Bt corn was reported in Nova Scotia, Canada. ECB populations were collected and bio-assayed. The results, published in fall 2019, confirm the first case of practical, field-evolved resistance by corn borer to any Bt trait. In their paper, entomologists from the University of Guelph highlight "preventable causal factors" contributing to ECB resistance in Nova Scotia. A key factor was the continued planting of single-trait Cry3Bt hybrids. To sell seed with reduced 9% or 10% refuge in the bag, seed companies were supposed to phase out single-trait hybrids and replace them with pyramided multiple-Bt hybrids to slow the development of resistance. This transition apparently did not happen in some places.

Unfortunately, single-trait hybrids are just part of the story. As insects become resistant to individual Cry proteins, pyramided hybrids effectively become single-trait hybrids. For example, because ECB is resistant to Cry3B in Nova Scotia, Cry3AB + Cry3F hybrids are functionally single-trait for Cry3AB in that province. Entomologists recommend that such pyramids not be used in that region to reduce the chance of ECB resistance to Cry3AB. Similarly, because western bean cutworm developed resistance to Cry3F, Vip 3A is the only effective toxin to control it. All Vip hybrids, regardless of the number of other Bts in plant, are single-trait for this key pest. Finally, in the southern US, corn earworm (aka cotton bollworm) is overcoming multiple-Bt toxins and Vip3a increasingly functions alone in pyramided corn and cotton. Although you can't control how traits are packaged or marketed, it is important to realize which hybrids you plant are not really pyramids, to scout fields for unusual pest pressure, and to report problems promptly so that resistance can be dealt with quickly, as in Nova Scotia.

Trade name for trait	Event	Protein(s) expressed	Primary Insect Targets + Herbicide tolerance
Agrisure DBL	Bt11	Cry3Ab + PAT	corn borer + glyphosate
Agrisure Duracade	S307	mCry3.1Ab	rootworm
Agrisure GT	GA23	EPSPS	glyphosate
Agrisure RW	NR604	mCry3A	rootworm
Agrisure Virginia	NR163	Vip3a20	beet and caterpillar control, except for corn borer
Enlist	DA640278	soy-F	2,4-D & VOPR
Intercrisp 1 (DK) or CB	TC1507	Cry1Fa2 + PAT	corn borer + glyphosate
Intercrisp CW	DA6-59122-2	Cry3AA1/Cry3AA3 + PAT	rootworm + glyphosate
Nono - part of Dremel	DB-413	Cry3F + Cry3AB1/Cry3AB3 + PAT	corn borer + rootworm + glyphosate
Roundup Ready 2	NR603	EPSPS	glyphosate

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Stink Bugs - Occurrence

17 species found in Nebraska

Green Stink Bug



Bright green color

Brown Stink Bug

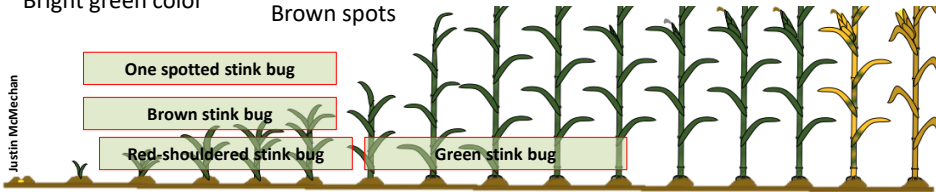


Yellow/tan color
Brown spots

One spotted Stink Bug



Red-shouldered Stink Bug

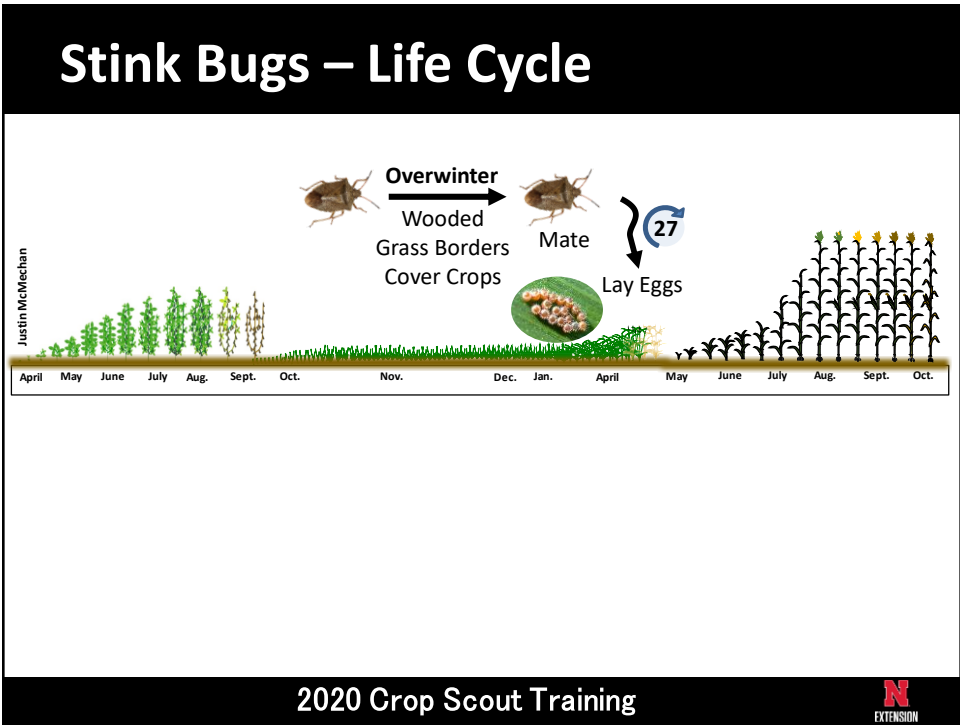
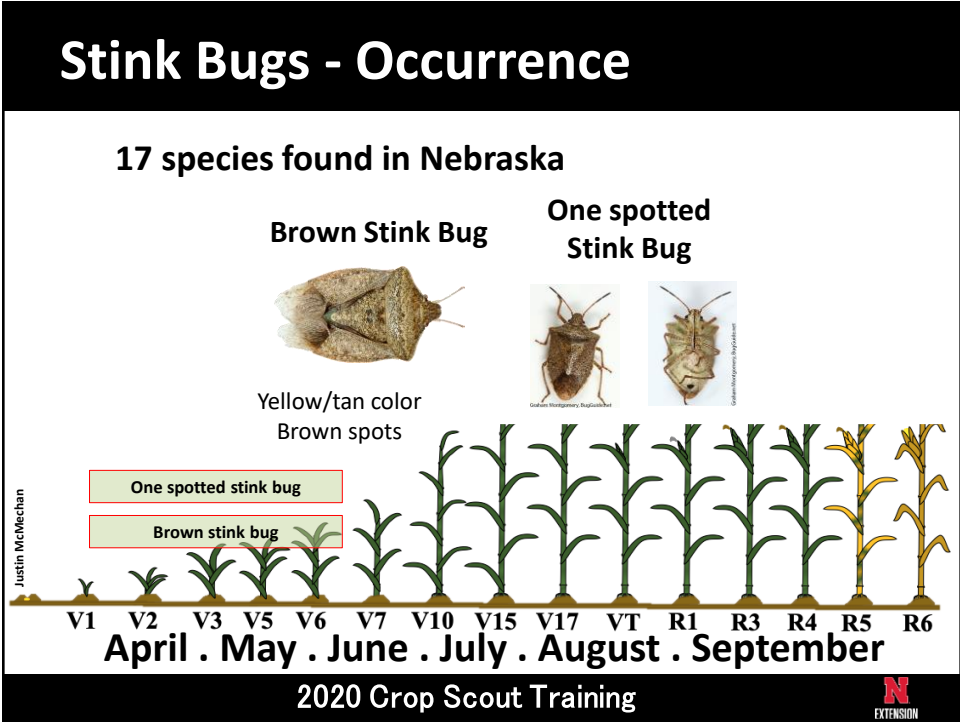


Justin McMechan

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Stink Bugs – Injury and scouting

Overwinter
 Wooded
 Grass Borders
 Cover Crops




Mate

Lay Eggs

27

Justin McMechan
 April May June July Aug. Sept. Oct. Nov. Dec. Jan. April May June July Aug. Sept. Oct.

- **Early season**
 - Kill small plants
 - Tillering
 - Repeating pattern of holes

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Stink Bugs – Injury and scouting

Overwinter
 Wooded
 Grass Borders
 Cover Crops




Mate

Lay Eggs

27

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 April May June July Aug. Sept. Oct. Nov. Dec. Jan. April May June July Aug. Sept. Oct.

- **Early season**
 - Kill small plants
 - Tillering
 - Repeating pattern of holes

Thresholds

5% damaged SB present

>10% infested Corn less than 2ft tall

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Stink Bugs – Injury and scouting

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Overwinter
Wooded
Grass Borders
Cover Crops

Mate

27

Lay Eggs

April May June July Aug. Sept. Oct. Nov. Dec. Jan. April May June July Aug. Sept. Oct.

- **Late season**
 - Aborted kernels
 - Banana ears

P. Thomison

P. Thomison

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Stink Bugs – Injury and scouting

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Overwinter
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Mate

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Lay Eggs

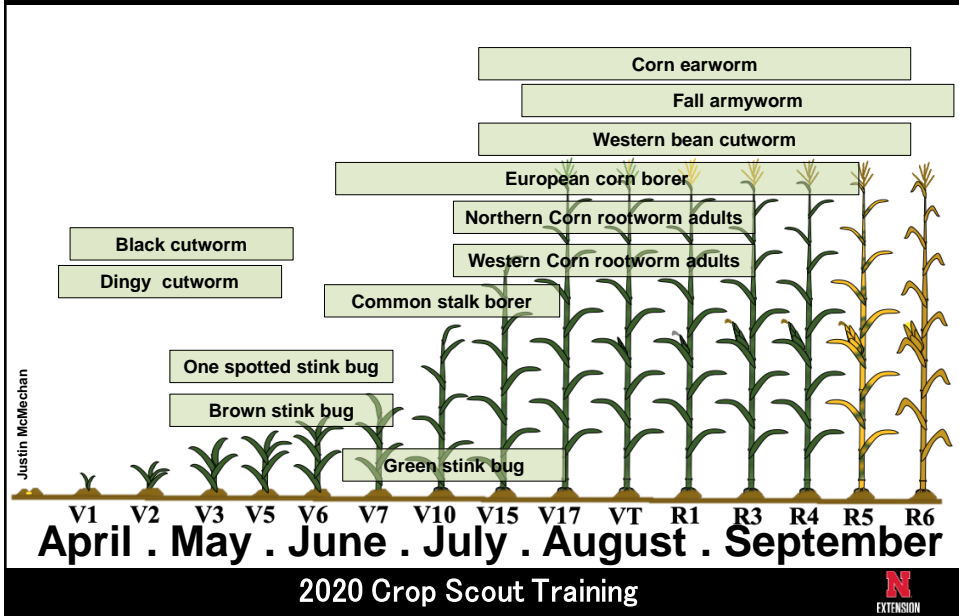
April May June July Aug. Sept. Oct. Nov. Dec. Jan. April May June July Aug. Sept. Oct.

- **Late season**
 - Aborted kernels
 - Banana ears

		Thresholds	
<p>P. Thomison</p>	<p>P. Thomison</p>	Ear forming to Pollen shed	Pollen shed to Blister
		<u>1 stinkbug</u> 2 plants	<u>1 stinkbug</u> 4 plants

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Insect corn pest Nebraska



Further information

NEBRASKA EXTENSION

Corn Insects - Quick Reference Guide

Corn Insects I

Corn Insects II

NEBRASKA SOYBEAN & CORN POCKET FIELD GUIDE - 2019 EDITION

CropWatch February 28, 2020

<https://entomology.unl.edu/extension>

<https://cropwatch.unl.edu/>

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EXTENSION

Thank you!

- Questions?
- Keep up to date on
 - CropWatch
 - Market Journal
- Twitter: @DeiaMontezano
@justinmcmechan
@KyleKochUNL



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