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## Why we did this study

- 1) Defoliation thresholds were developed in the 1980s
  - \* has defoliation risk increased since then?
  - \* have the main defoliators changed?  
(Japanese beetle, painted lady, etc.)
- 2) Should thresholds be different or updated?
- 3) Thresholds vary a bit among NC states
  - \* can we agree on regional values?

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## Proposed regional threshold:

### V1-R2: 30%

- Plant is less susceptible to damage, able to compensate for lost tissue

### R3-R5: 10%

- This is when soybean is most susceptible to yield loss from defoliation

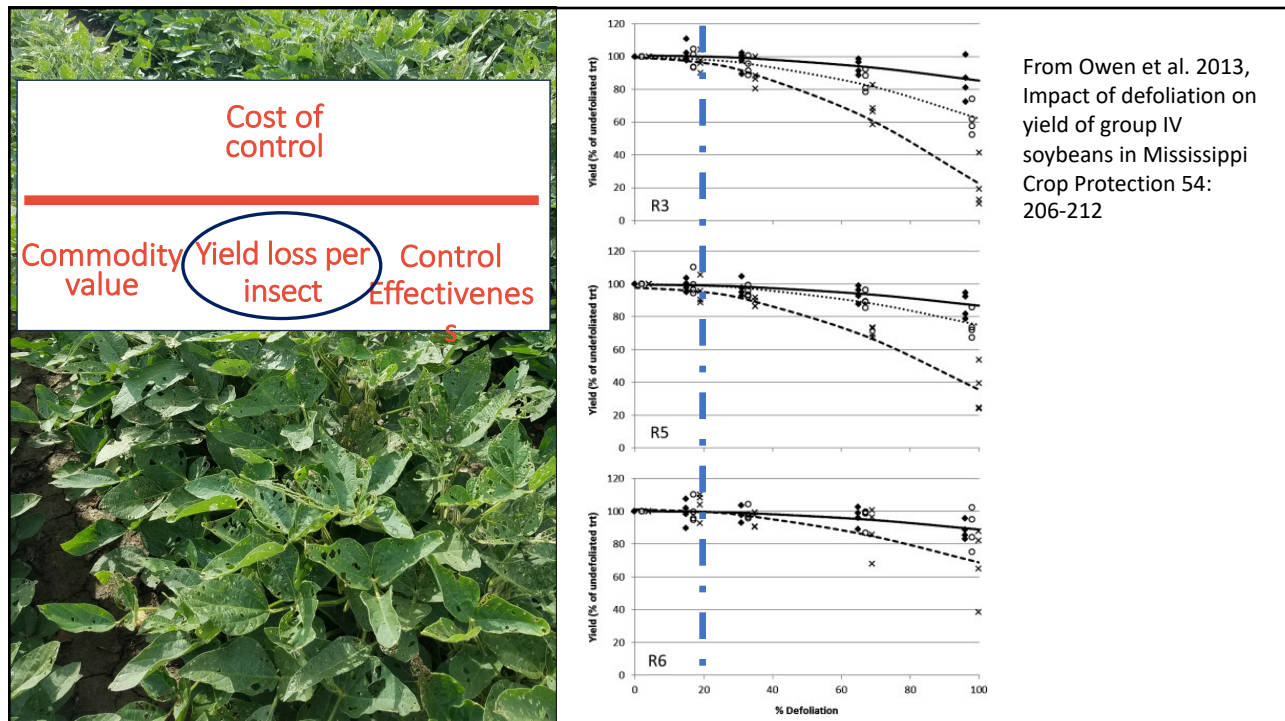
### R6: 15%

- This does not account for pod feeding by bean leaf beetle
- Application no longer necessary at R7 (seed fill complete)

Thresholds calculated based on:

- Control cost (pesticide + application): **\$8/acre**
- Yield potential: **50 bushels per acre** (5-yr average)
- Soybean price: **\$10.88** (15-yr average)
- Thresholds set at 75% of economic injury level

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## Should thresholds be different or updated?

### Average yield & price (5 yr)

- Yield potential: 50 bu/a
- Soybean price: \$10/bu
- Control cost: \$8/a

### Economic threshold:

- 11% R3-R5
- 17% R6

### Hi-average (IL, 2021)

- Yield potential: 64 bu/a
- Soybean price: \$13.20<sup>a</sup>/bu
- Control cost: \$8/a

### Economic threshold

- 8% R3-R5
- 13% R6

### High price and yield

- Yield potential: 100 bu/a
- Soybean price: \$17.50/bu
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### Economic threshold

- 6% R3-R5
- 9% R6

Current R-stage threshold in IL: 20%

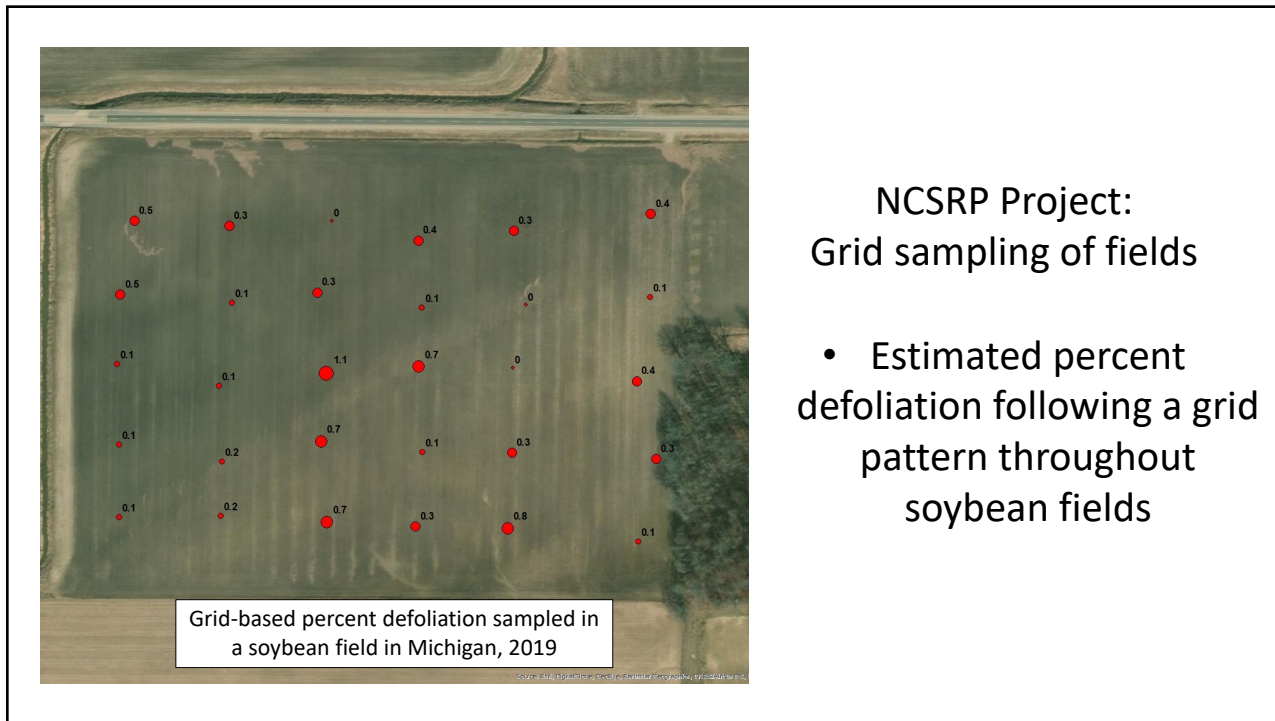
(Based on calculations from Owen et al. 2013 Crop Protection 54: 206-212); <sup>a</sup> 2021 marketing year price received

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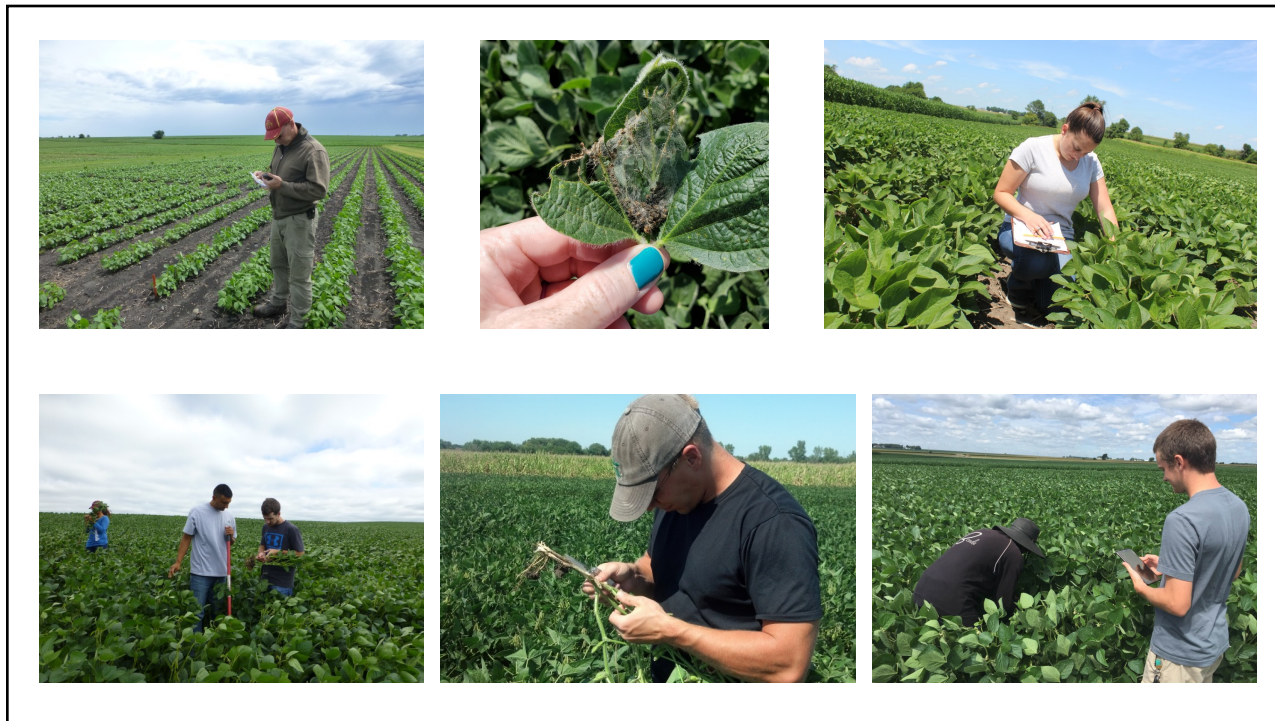
- NCSRP funded project
- Sampled 65 individual fields
- IA, IL, IN, KS, MI, OH, ND
- When possible, targeted fields with concerning levels of defoliation



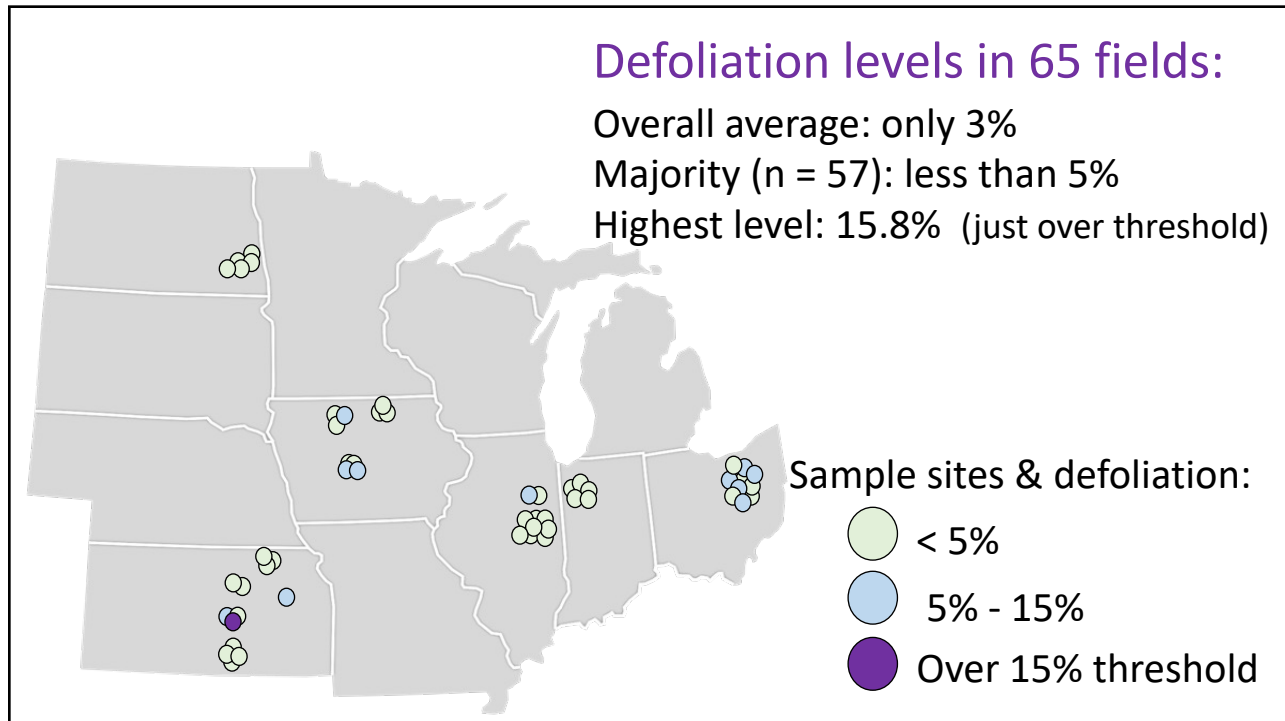
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Under the highest yield/price scenario,  
an insecticide application would be justified  
only on **1 of the 65 fields (1.5%)** that we sampled  
  
...and recall, we targeted locations with defoliation.  
The actual % of fields over threshold would be less.

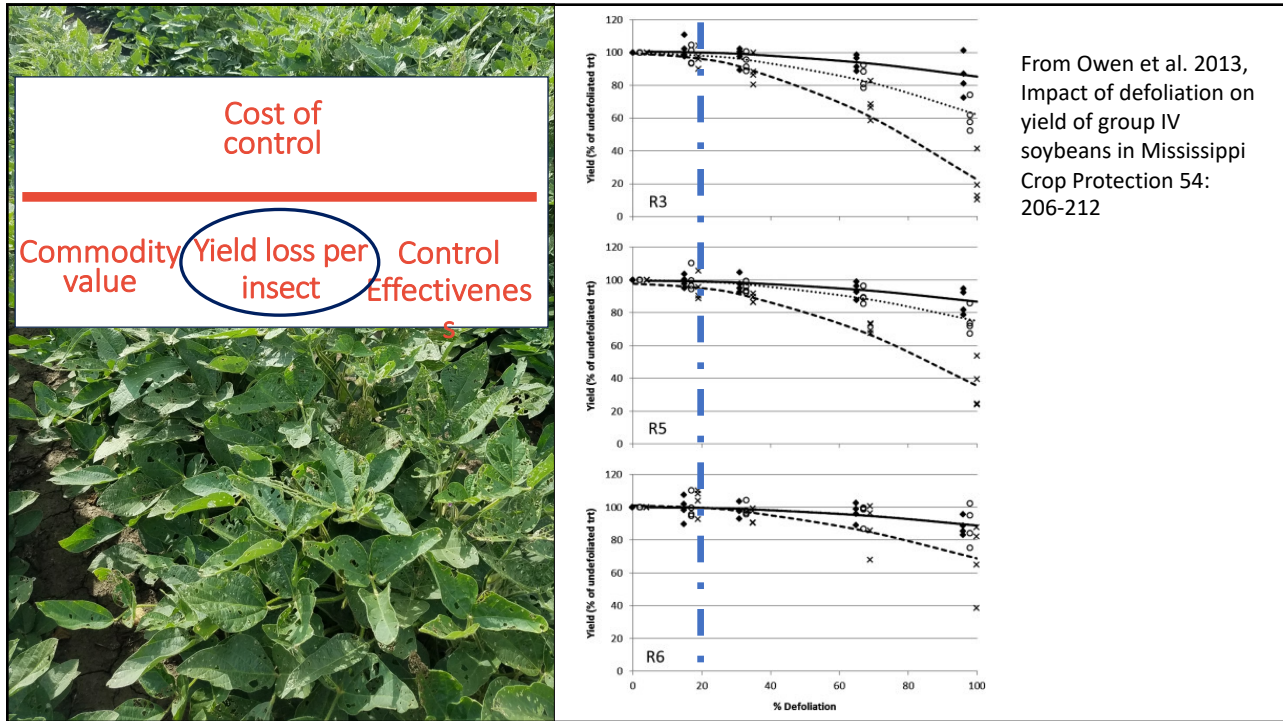
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		Soybean Yield			
		Worst case scenario (2012 drought) 40 bu	US Avg 50 bu	Highest Avg In Midwest (2021): 64 bu/ ac (IL)	Highest yielding environment 100 bu
Soybean Price	Lowest price (last 15 years): \$6.63	0 fields sprayed	1 field sprayed	1 field sprayed	1 field sprayed
	15-yr average price: \$10.88	1 field sprayed	1 field sprayed	1 field sprayed	1 field sprayed
	Spring 2022: \$17.50	1 field sprayed	1 field sprayed	1 field sprayed	1 field sprayed

How many fields (out of the 65 we sampled) would we have sprayed under various scenarios?

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### Examples of defoliation at R6 (full seed set)



6 Percent

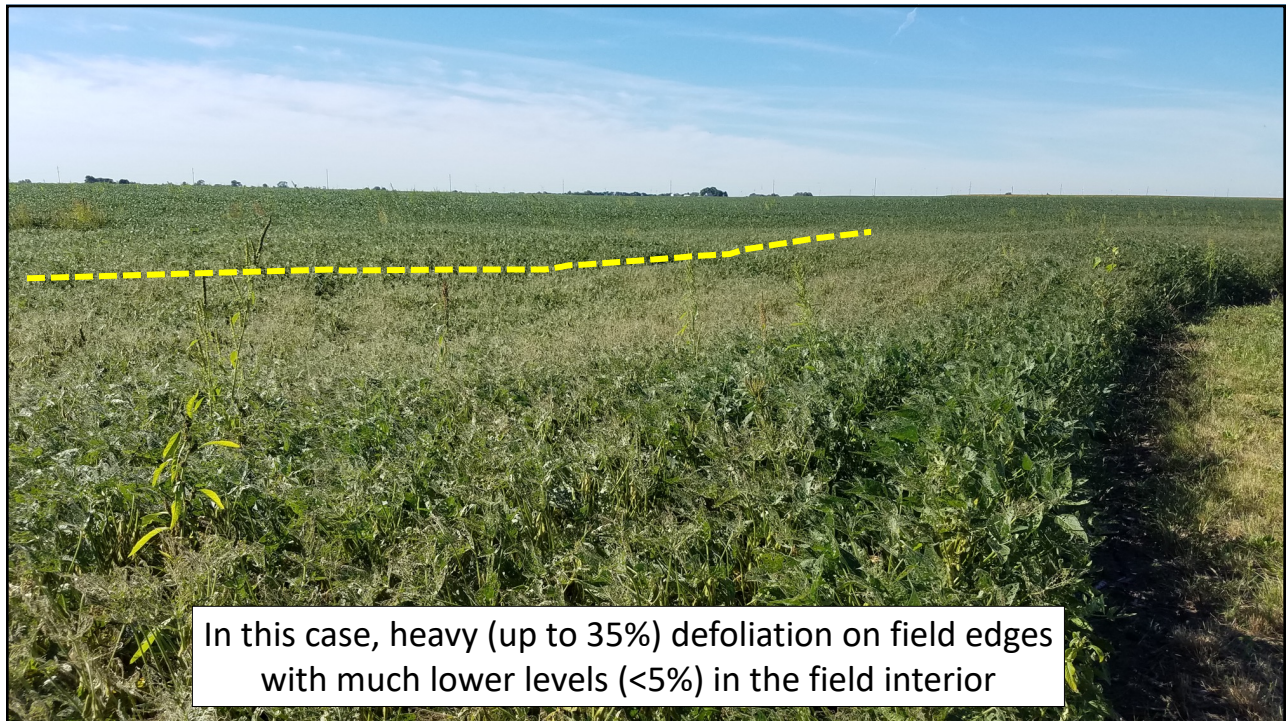


15 Percent



35 Percent

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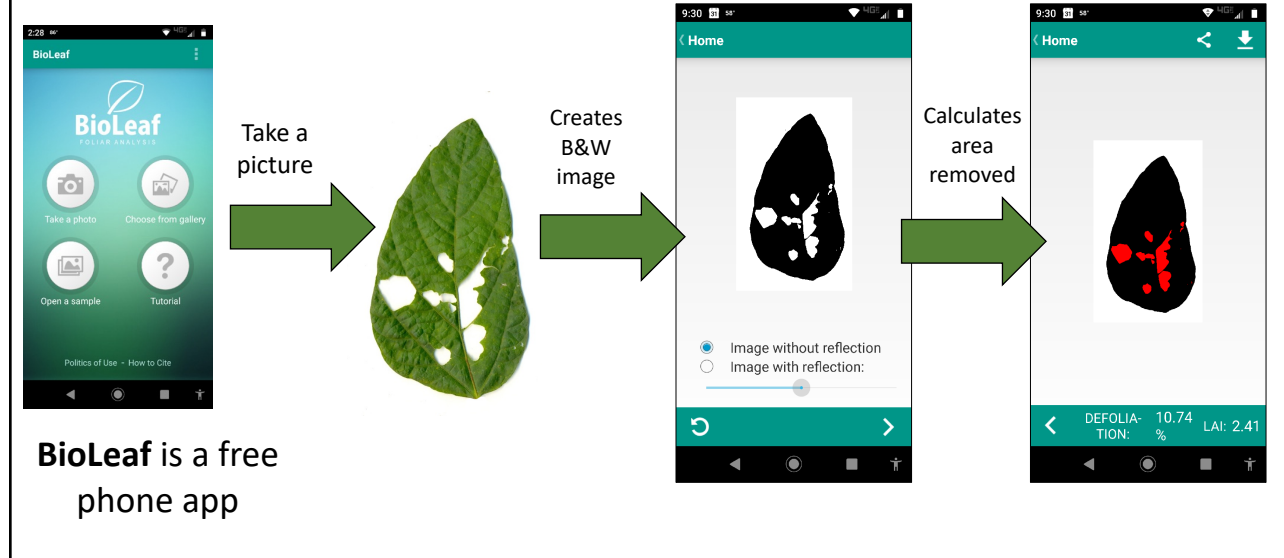


In this case, heavy (up to 35%) defoliation on field edges with much lower levels (<5%) in the field interior

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## Checking visual defoliation estimates



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## Practice your defoliation eye!

- Crop Protection Network
- Encyclopedia of common defoliators
- Defoliation training tool
  - <https://bit.ly/37MLEzw>

Example Coverage: 47%

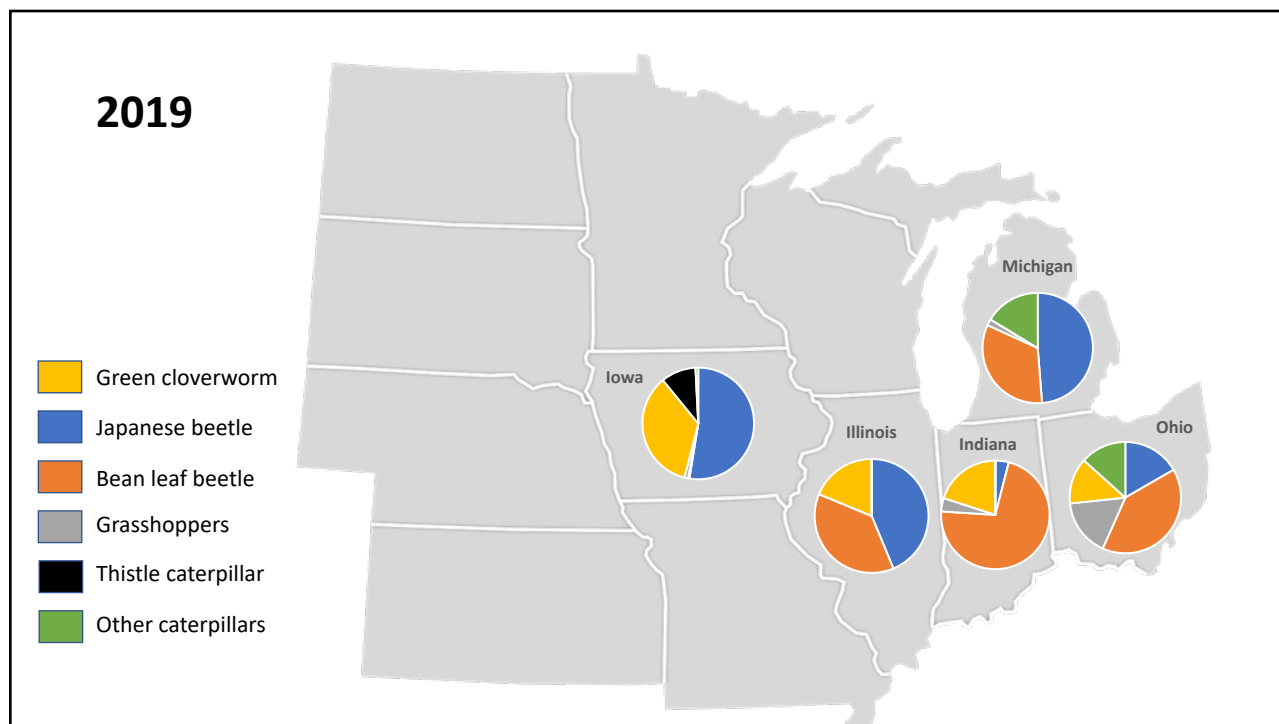


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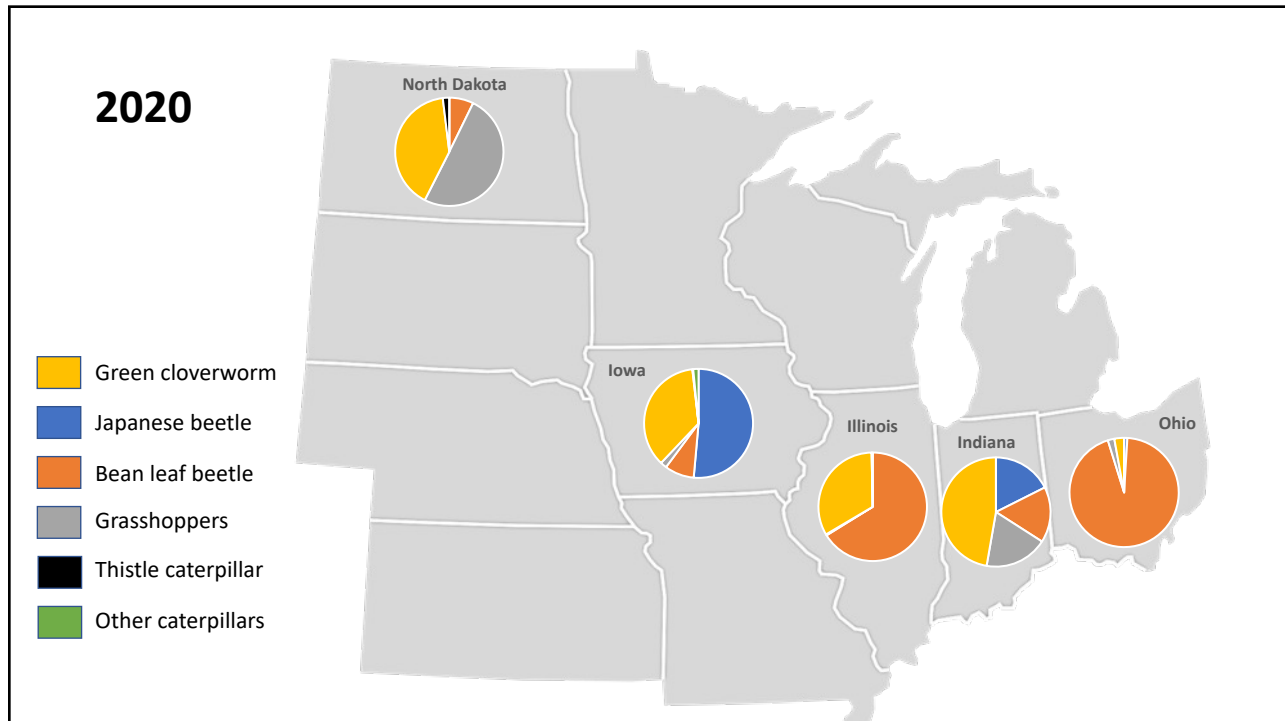


# What insect defoliators are most common?

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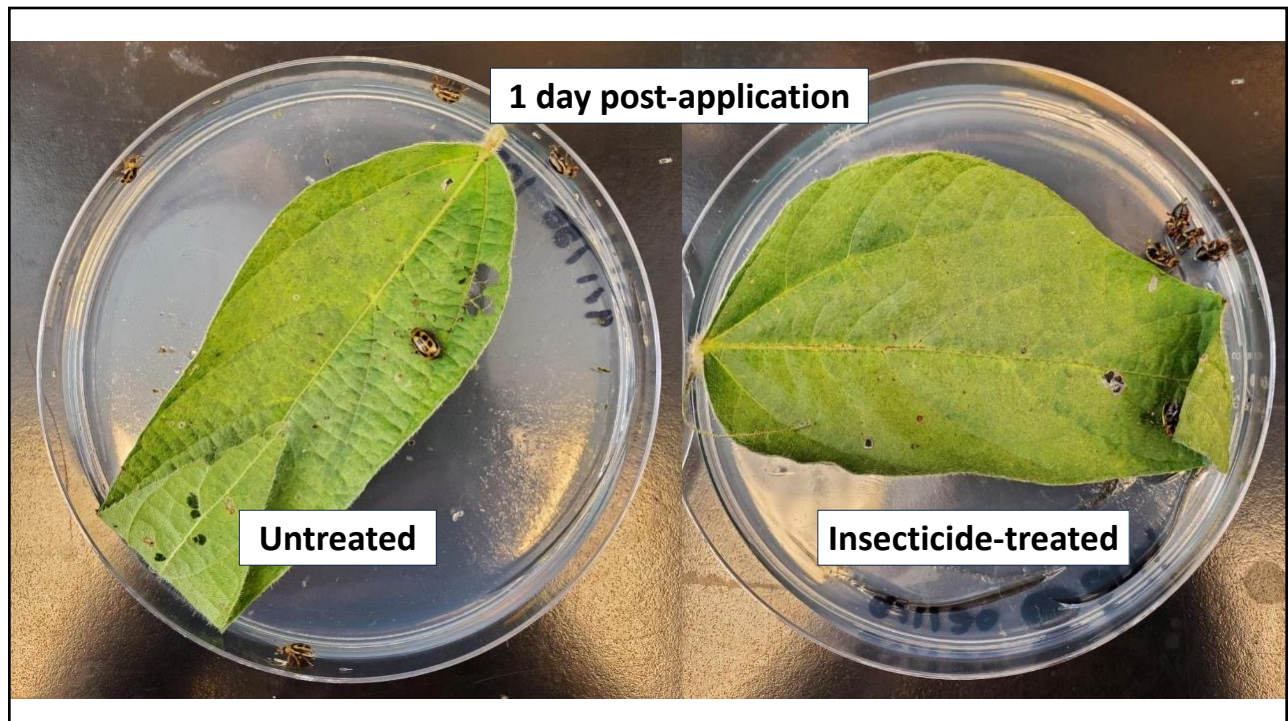
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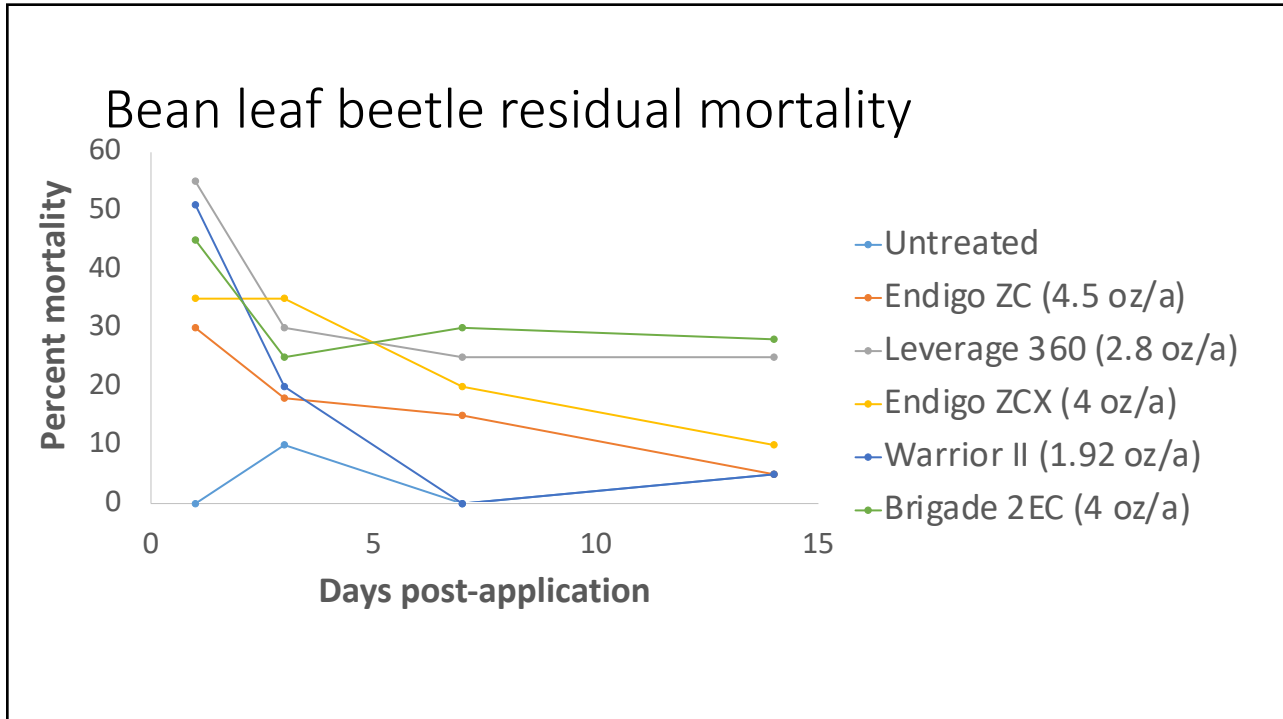
# How long do insecticide applications provide effective control?

Illinois Soybean Association-funded project

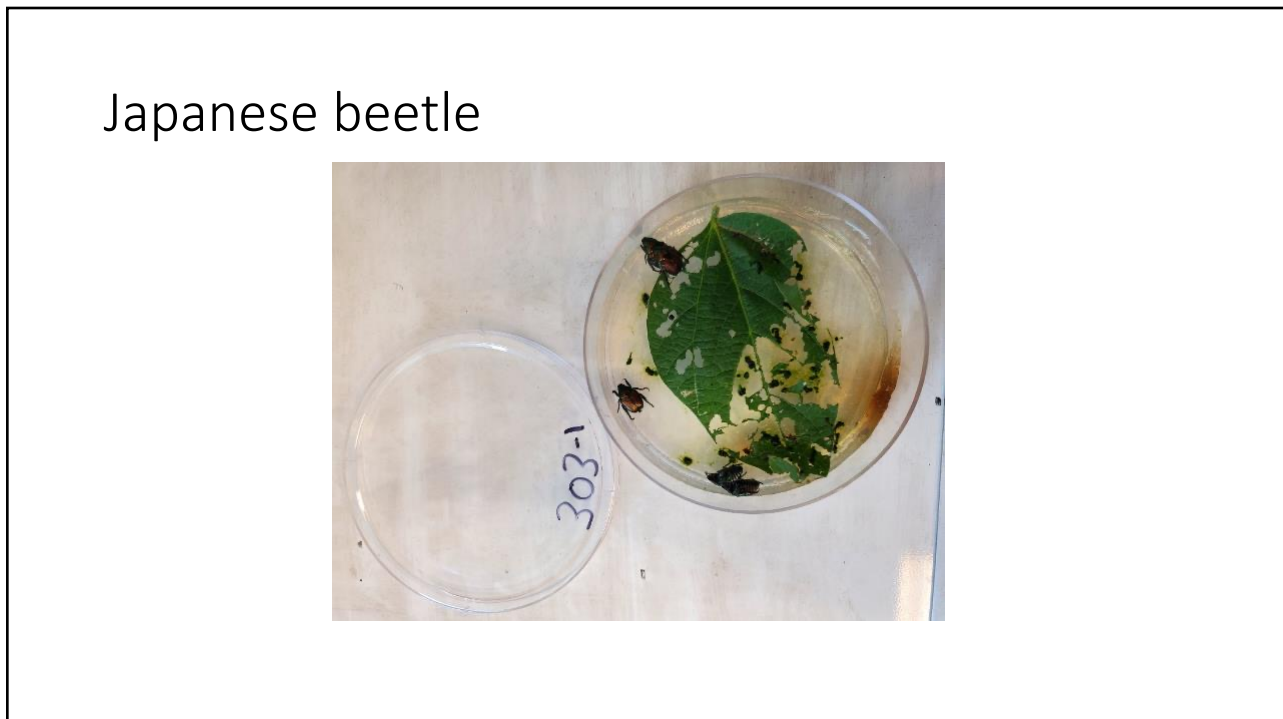
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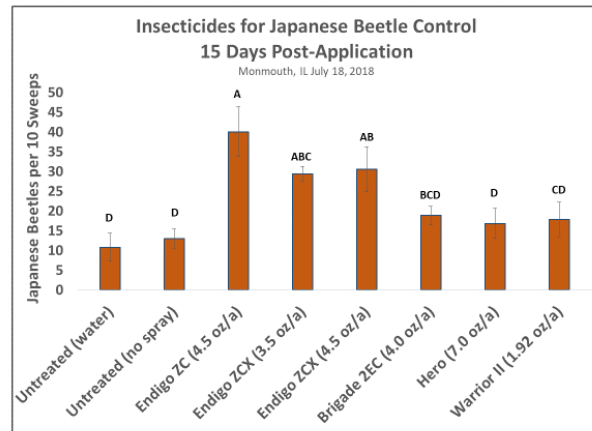
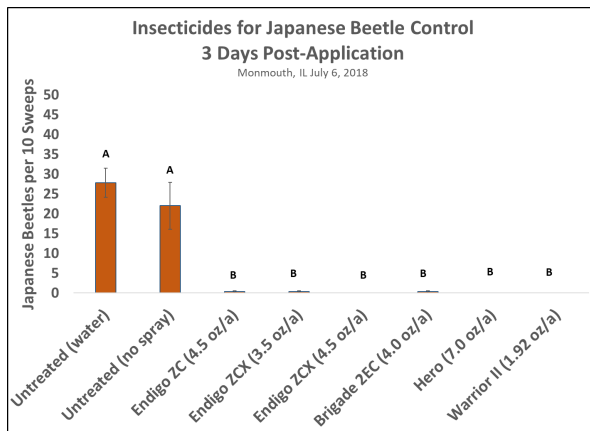


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## Japanese beetle – percent defoliation

Treatment	3 days post-application	8 days post-application	10 days post-application	15 days post-application
Untreated	20.0 ± 7.0 a	15.8 ± 2.4 a	17.1 ± 2.4 ab	8.9 ± 3.1 a
Leverage 360 (2.8 oz/a)	0.2 ± 0.1 b	2.2 ± 1.1 b	0.9 ± 0.3 c	5.6 ± 2.8 a
Warrior II (1.96 oz/a)	0.4 ± 0.1 b	7.3 ± 0.9 ab	17.8 ± 5.1 a	17.0 ± 4.0 a
Besiege (8 oz/a)	0.2 ± 0.1 b	9.9 ± 5.6 ab	7.9 ± 2.2 bc	9.7 ± 2.4 a

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## Insecticide residual activity

- It's going to vary with material, weather, species....
- Unlikely to get more than 10-14 days of effective control with most materials we use
  - Pyrethroids, pyrethroid-neonic mixes
- What you see in the field is a function of:
  - Initial knockdown
  - Residual activity
  - Population dynamics/movement patterns of the pest



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### In summary

- **Insect defoliation in North Central region is usually well-below economically damaging levels**
- **This remains true when economic thresholds are adjusted to current soybean values**
- **Defoliation that exceeds an economic threshold, though rare, is eye-catching when it occurs – you're unlikely to miss it**

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### Resources:

Applied Pest Management Research (2022 report available soon):

<https://go.illinois.edu/PestManagementResearchReport>

Production information: <http://go.illinois.edu/cropcentral>

Illinois Agronomy Handbook: <https://go.illinois.edu/agronomyhandbook>

Soybean defoliation scout card:

[https://aginsects.osu.edu/sites/aginsects/files/imce/Soybean%20defoliation%20draft%208\\_4\\_22.pdf](https://aginsects.osu.edu/sites/aginsects/files/imce/Soybean%20defoliation%20draft%208_4_22.pdf)



**Illinois Extension**  
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

Dr. Nick Seiter  
[nseiter@illinois.edu](mailto:nseiter@illinois.edu)  
Twitter: @nick\_seiter  
Cell: (812) 593-4317

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