



Using 2020 Corn Rootworm Beetle Counts to Assess the Risk of Economic Injury in 2021

Trial Objective

- Monitoring of corn rootworm (CRW) beetle numbers in current corn and soybean fields can be used to help assess the potential risk of a CRW larval infestation reaching economic damage levels in corn fields during the next growing season.
- This information may help guide decisions regarding management strategies including corn product selection.
- The objective of this study was to measure adult CRW populations in corn and soybean fields in 2020 to assist in risk evaluation for 2021.

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
1440 fields	Drained or well-drained	Various	Various	Various	Various	110-250	Various

- One to four Pherocon® AM non-baited trapping sites were established at 1440 field locations across the corn-growing areas of IA, IL, IN, OH, MI, WI, MN, ND, SD, NE, KS, CO, and MO (Figure 1).
- The trapping sites were installed in the interiors of corn and soybean fields that encompassed a variety of crop and management histories. Soybean fields were sampled in parts of the corn-growing area to assess the potential risk associated with the variant western CRW, which is known to lay eggs in soybean fields.
- The Pherocon® AM traps were changed at 5- to 10-day intervals for 2-8 consecutive weeks through CRW adult emergence, mating, and egg laying phases (late July through late September).
- Following each sampling interval, the counts of adult northern and western CRW beetles were recorded and used to calculate the average number of CRW beetles/trap/day by field.
- At the end of the collective sampling period, the average capture value for each field was determined and the data were used in further analysis.

Understanding the Results

Categories for CRW beetle counts are based on action thresholds (beetles/trap/day) suggested by Extension entomologists at the University of Illinois (UI) and Iowa State University (ISU) and provide the economic injury potential for the following season.^{1,2}

- Less than 2 beetles/trap/day indicate a relatively low risk of economic injury.
- Greater than 1 beetle/trap/day suggests a low risk for economic injury but could indicate populations are increasing.
- Greater than 2 beetles/trap/day indicate the probability for economic injury is likely if control measures are not used.
- Greater than 5 beetles/trap/day indicate that economic injury is very likely, and populations are expected to be very high the following year.



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CRW 2020 Data, Corn Fields (N=1123)

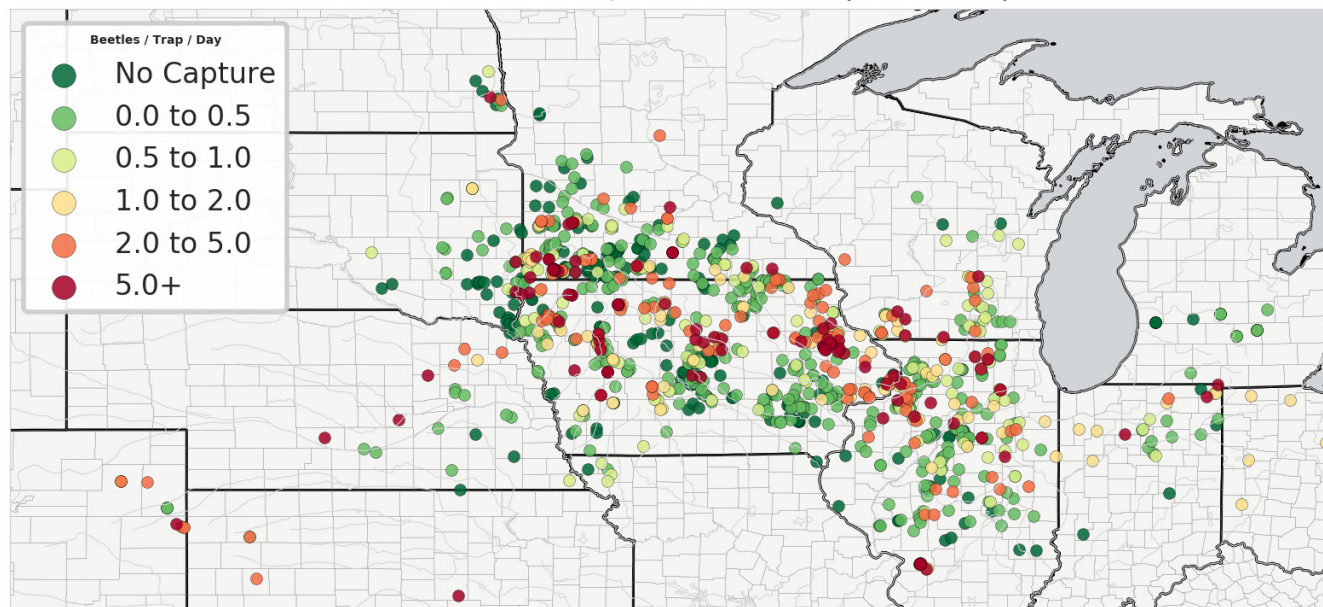


Figure 1a. Corn field locations for corn rootworm trapping in 2020.

CRW 2020 Data, Soybean Fields (N=317)

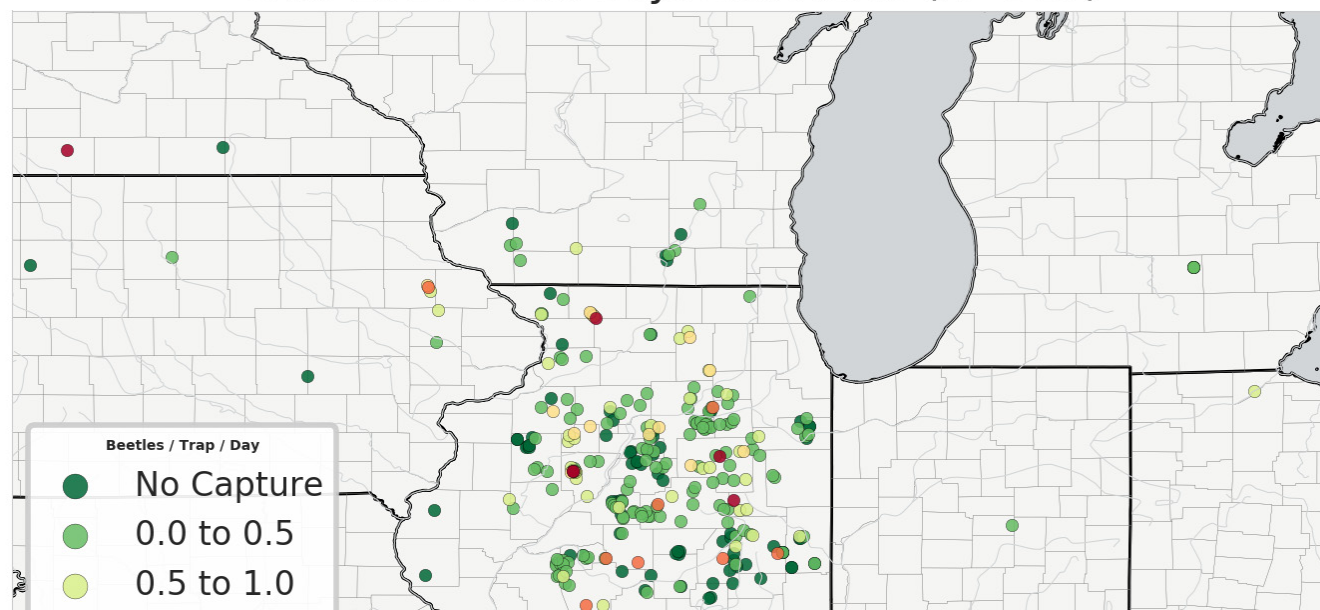
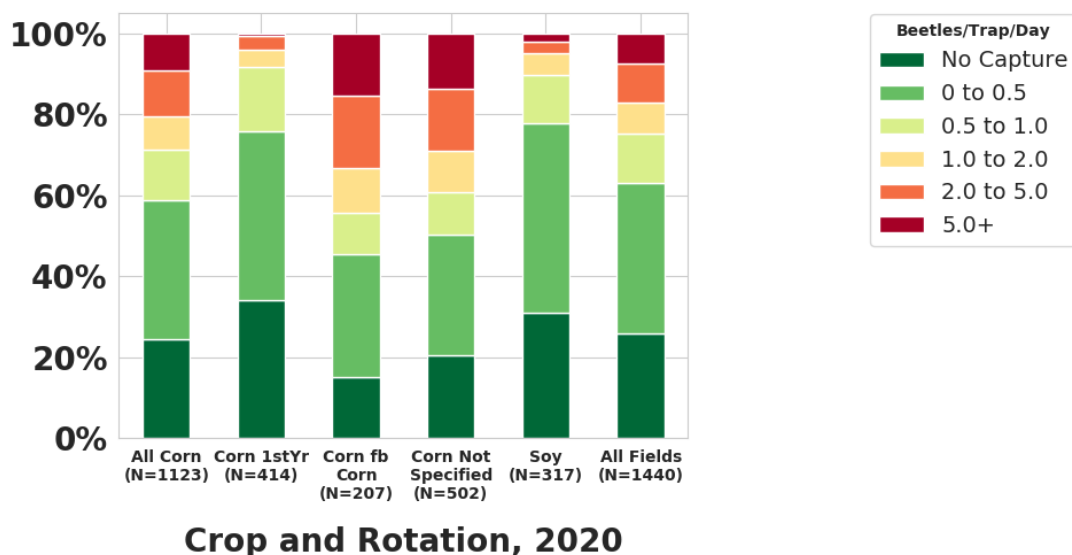


Figure 1b. Soybean field locations for corn rootworm trapping in 2020.

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(Data in this graph are the result of field trials conducted on 1440 field plots in 13 different states in 2020).

Figure 2. Overall summary of average corn rootworm beetles captured per trap per day.^{1,2}

Table 1. Summary of field sampling and adult corn rootworm captures in 2020.			
2020 Crop	2019 Crop	Number of Sampled Fields	Average Peak Number of Corn Rootworm Beetles/Trap/Day
Total Corn	All Rotations	1123	1.73
Corn	Soybean	414	0.42
Corn	Corn	207	2.79
Corn	Not Specified	502	2.36
Soybean	Corn	317	0.5
Corn and Soybean	All Rotations	1440	1.46

2020 CRW Beetle Survey Data

- CRW populations were variable across the corn-growing area, which suggests that environment and management affect CRW pressure.
- 22% of corn fields had counts exceeding the economic threshold of 2 beetles/trap/day.
- 8% of the corn fields were approaching threshold levels.
- Corn followed by (fb) corn had higher average maximum daily counts than first-year corn (2.79 vs. 0.42 beetles/trap/day) (Table 1).
- Of the corn fb corn fields, 33% exceeded the economic threshold while less than 3.9% of first-year corn fields exceeded the threshold (Figure 2).
- Counts from soybean fields were low, with no adults being captured in 29% of the fields and fewer than 4.7% of the fields exceeding the threshold.
- Counts of 0 were recorded in 21% of corn fields sampled.



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2020 Data Interpolation

- Point data were interpolated to estimate populations and relative risk at the landscape level.
- To account for variations in sampling density and distribution, interpolations were based on average maximum values calculated within a systematic grid applied to the estimation area.
- On a broad scale, CRW populations, and consequently 2021 risk potential, are possibly elevated in corn fields in central and southwest NE, northeast CO, northwestern KS, west, central, and east central IA, southwest WI, northern IL, central and southern MN, and southeastern ND (Figure 3).
- Corn rootworm populations are estimated to be relatively low in many parts of ND, SD, MN, IN, and central IL; however, localized hot spots can be found every year.
- CRW beetle presence in soybean fields was found to be low in most of the areas that were sampled.

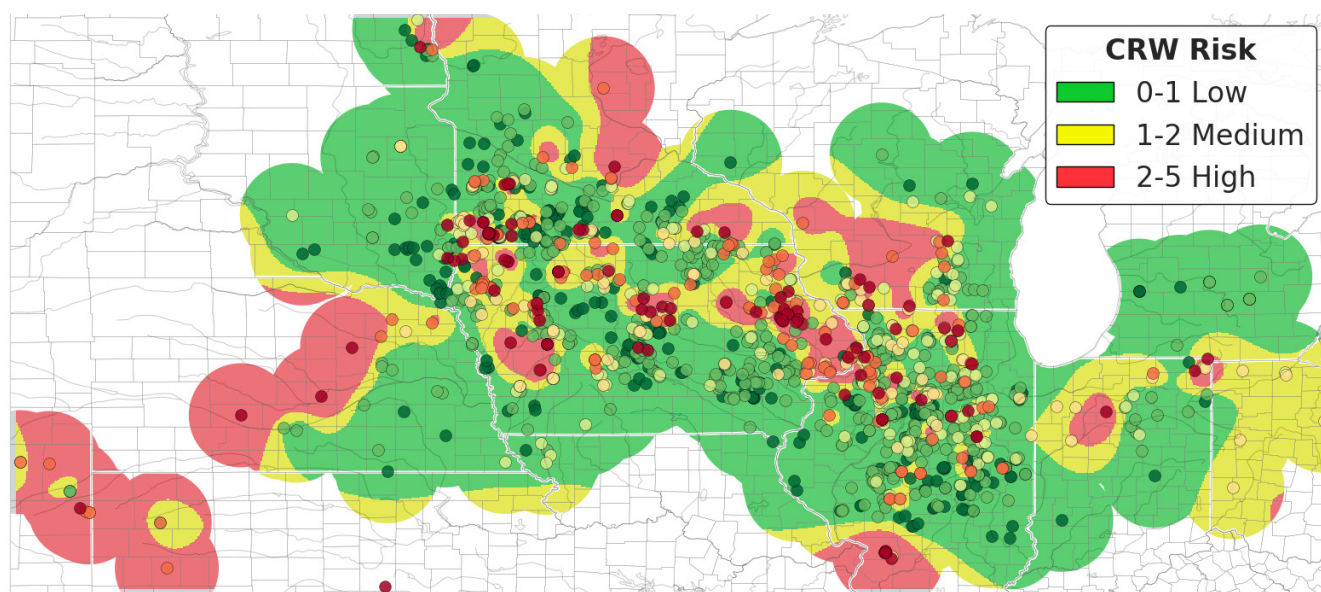


Figure 3. Estimated corn rootworm risk in 2021 using interpolated 2020 corn rootworm data from all fields sampled.

Comparison of 2019 vs. 2020 CRW Beetle Data (Figures 4a and 4b).

- Absolute comparisons between 2019 and 2020 populations should be made with limited confidence due to differences in sampling intensity and distribution. However, trends may still be reliably identified.
- Areas with large populations (i.e. “hot spots”) are generally consistent from year to year.

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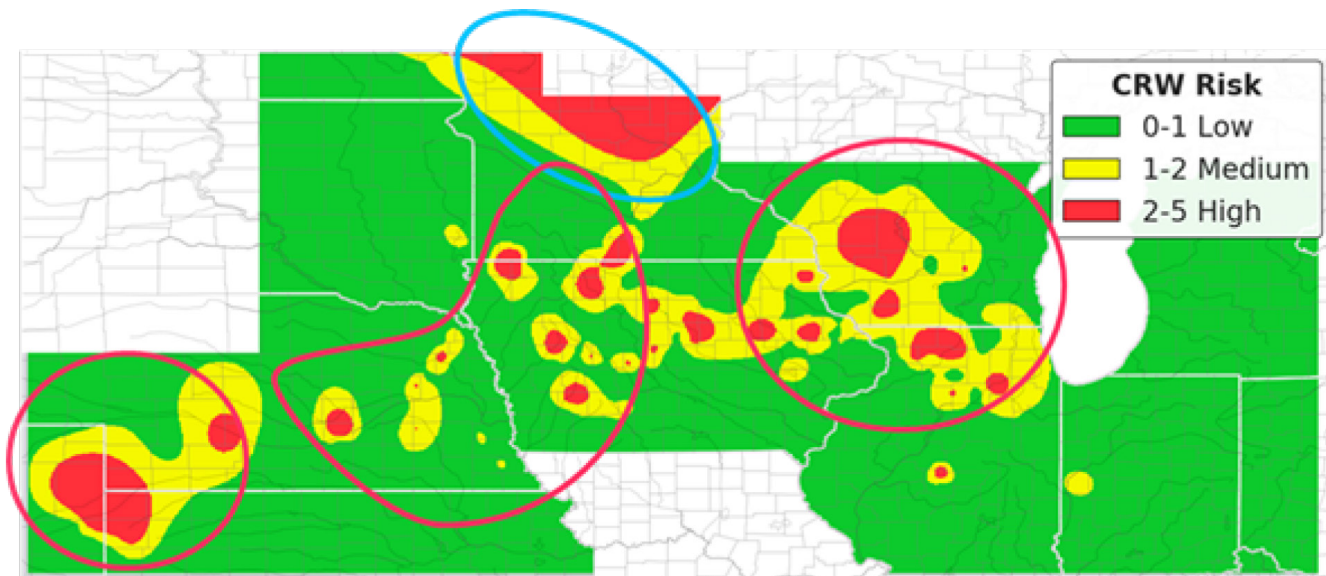


Figure 4a. Estimated corn rootworm risk in 2020 using interpolated 2019 corn rootworm counts from corn fields sampled (based on 1123 fields).

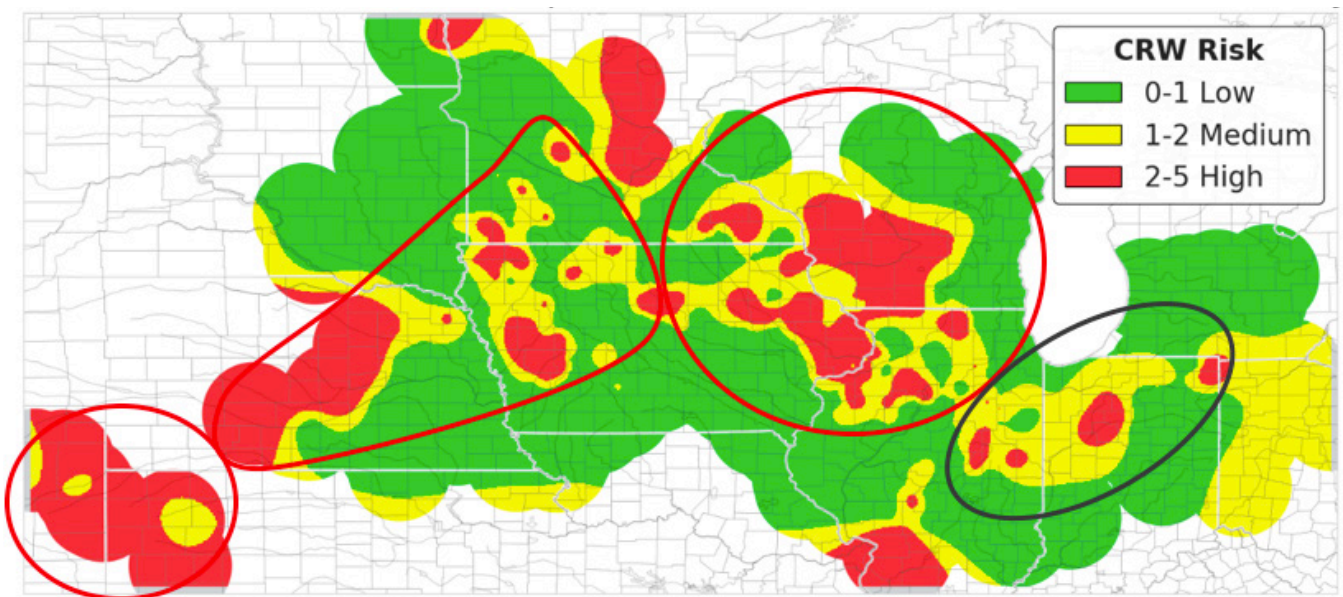


Figure 4b. Estimated corn rootworm risk in 2021 using interpolated 2020 corn rootworm counts from corn fields sampled (based on 1123 fields).

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Key Learnings

- Corn rootworm is a persistent and annual threat to yield and profit potential, making it a pest that cannot be ignored. University research has demonstrated that even a moderate level of CRW feeding can cause yield losses averaging 15% with losses of 45% or more being possible.³
- In the absence of site-specific data, local/regional surveys may provide insight at the landscape level and can be used to make informed decisions regarding management and product selection decisions.
- Beetle numbers and infestation geographies change. Continue to monitor present and historical data to gain information regarding CRW infestation potential. This information can be used to help prepare for the 2021 season and the selection of CRW *Bacillus thuringiensis* (B.t.)-protected corn products or soil-applied insecticides to protect your crop against the risk of CRW larvae damaging roots and reducing your yield potential.

Sources

¹ Western corn rootworm. *Diabrotica virgifera virgifera* LeConte. Extension & Outreach. Department of Crop Sciences. University of Illinois. http://extension.cropsciences.illinois.edu/fieldcrops/insects/western_corn_rootworm.

² Hodgson, E. and Gassmann, A. 2016. Guidelines for using sticky traps to assess corn rootworm activity. Integrated Crop Management. Iowa State University. <https://crops.extension.iastate.edu/cropnews/2016/06/guidelines-usingsticky-traps-assess-corn-rootworm-activity>.

³ Tinsley, N.A., Estes, R.E., and Gray, M.E. 2012. Validation of a nested error component model to estimate damage caused by corn rootworm larvae. *Journal of Applied Entomology*.

Legal Statements

The information discussed in this report is from a multiple site, replicated demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

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