



Using 2023 Corn Rootworm Beetle Counts to Assess the Risk of Economic Injury in 2024

Trial Objective

- The objective of this study was to measure corn rootworm (CRW) beetle populations in corn and soybean fields in 2023 to assist in evaluating the potential risk for CRW feeding in corn fields in 2024.
- The monitoring of CRW beetle numbers in current corn and soybean fields can be used to help assess the potential risk of CRW larval infestations reaching economically damaging levels in the following corn crop.
- The data may help guide CRW larval management decisions, including corn product selection, for the next corn crop.

Research Site Details

Number of Fields	2023 Crop	2022 Crop
592	Corn	Corn
277	First Year Corn	Not Corn
8	Corn	Not Specified
27	Soybean	Not Specified

- One to four Pherocon® AM non-baited trapping sites were established in 2023 at 904 field locations across the corn-growing areas of CO, IA, IL, IN, KS, MI, MN, MO, NE, ND, OH, SD, WI, and Ontario, Canada (Figure 1).
- The trapping sites were placed in the interiors of corn and soybean fields that encompassed a variety of crop and management histories (Figure 2 and Table 1). Soybean fields were sampled in parts of the corn-growing area to assess the potential risk associated with the western corn rootworm variant, which is known to lay eggs in soybean fields.
- The Pherocon® AM traps were changed at 5- to 10-day intervals for 2 to 6 consecutive weeks through CRW adult emergence, mating, and egg laying phases (late July through late September).
- Following each sampling interval, counts for northern and western CRW beetles were recorded and used to calculate the average number of CRW beetles per trap per day (beetles/trap/day) by field (Table 1 and Figure 4).
- At the end of the collective sampling period, the highest average capture value for each field was determined and the data were used in further analysis.

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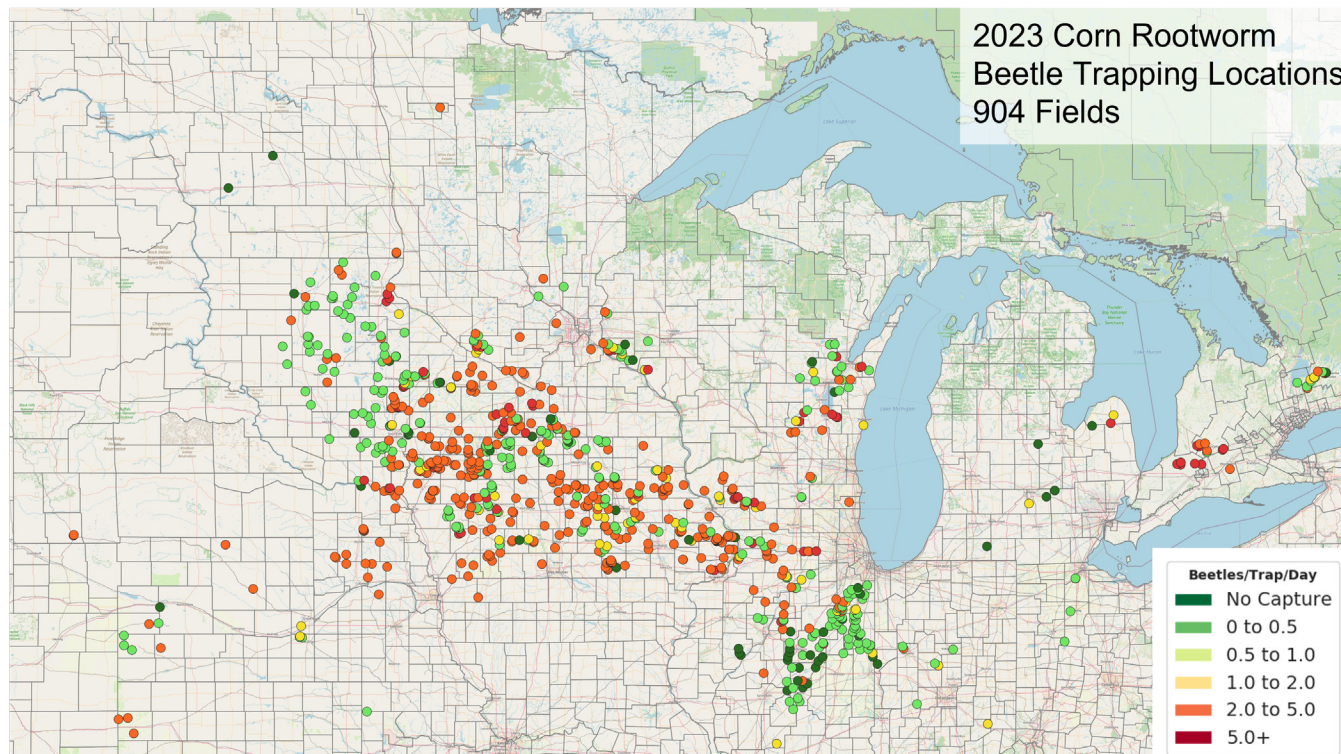


Figure 1. In 2023, 904 fields were surveyed using Pherocon® AM sticky traps in CO, IA, IL, IN, KS, MI, MN, MO, NE, ND, SD, WI, and Ontario, Canada to help determine the risk of corn rootworm feeding damage to corn in 2024.

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 and Iowa State University 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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2023 Corn Rootworm Beetle Survey Data

- Corn rootworm populations varied by crop rotation (Figure 2 and Table 1).
- Populations of CRW were variable across the corn-growing area, which suggests that both the environment and management practices affect CRW pressure (Figure 3).
- 53% of the corn fields sampled had counts exceeding the economic threshold of 2 beetles/trap/day, which was equal to percent of fields in which exceeded the economic threshold 2022 and up from 38% in 2021.
- 71% of the continuous corn fields sampled were above the economic threshold, which was down from 74% in 2022 and up from 52% in 2021.
- 14% of the first-year corn fields were above the economic threshold, which was 4 percentage points higher than 2022 (10%) and down 3 percentage points from 2021 (17%).

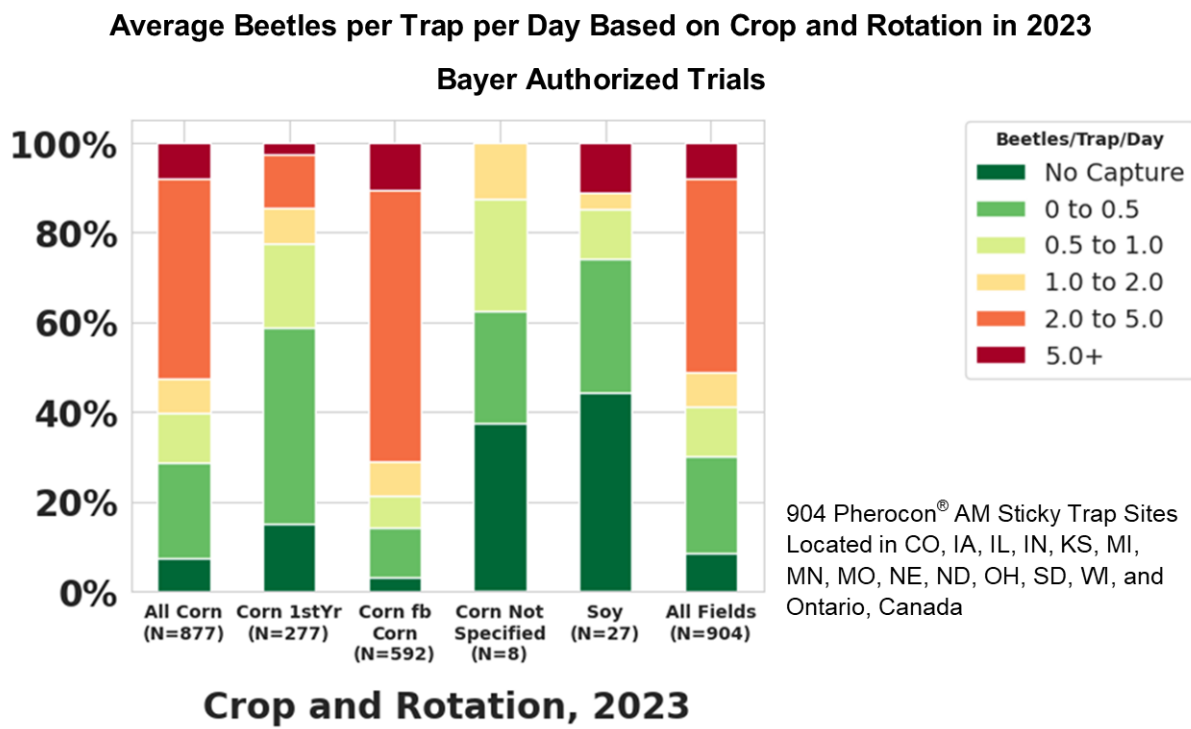


Figure 2. Overall summary of average corn rootworm beetles found per trap per day by crop rotation in 2023. (904 fields in CO, IA, IL, IN, KS, MI, MN, MO, NE, ND, OH, SD, WI, and Ontario, Canada).

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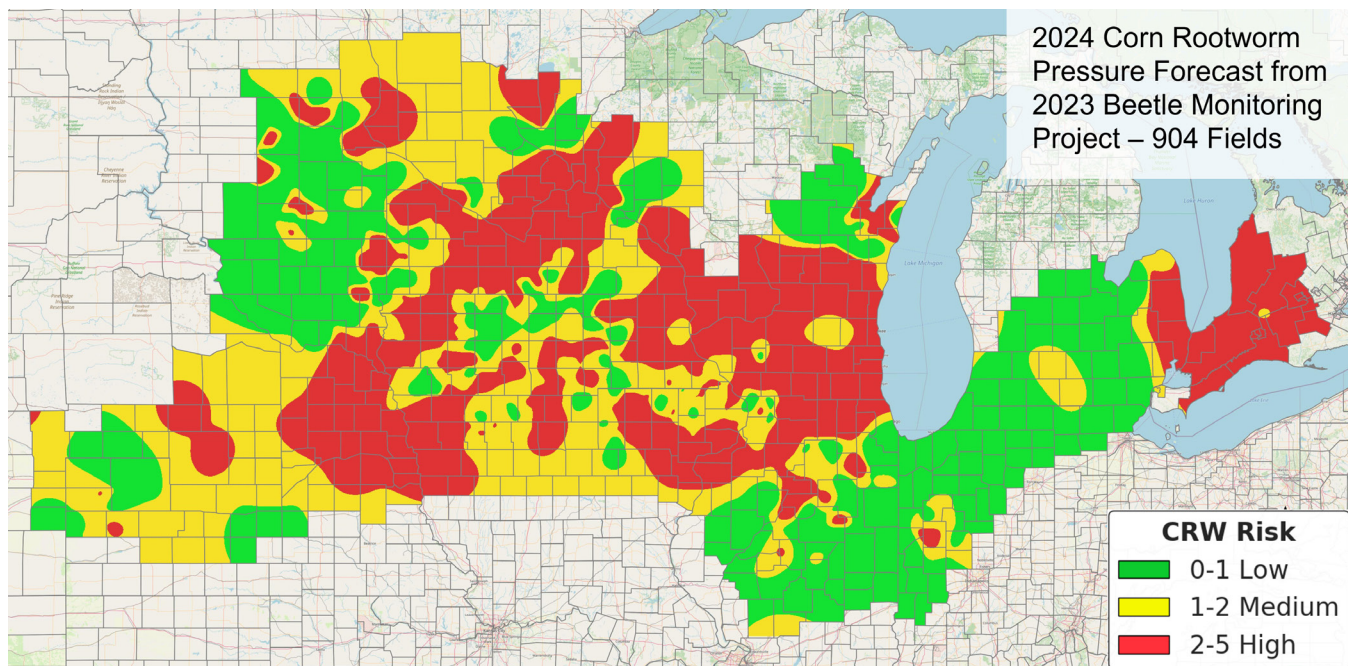


Figure 3. 2024 corn rootworm pressure forecast based on 2023 beetle capture in 904 fields in CO, IA, IL, IN, KS, MI, MN, MO, NE, ND, OH, SD, WI, and Ontario, Canada.

Table 1. Summary of field sampling and corn rootworm beetle captures in 2023.

2023 Crop	Previous 2022 Crop	Number of Sampled Fields	Average Peak Number of Corn Rootworm Beetles/Trap/Day
Total Corn	All rotations	877	3.04
First Year Corn	Not Specified	277	0.91
Corn (continuous)	Corn	592	4.06
Corn	Not Specified	8	6.52
Soybean	Not Specified	27	11.32
Corn and Soybean	All Rotations	904	3.28

2023 Data Interpolation

- Point data was 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 2023 risk potential—are possibly elevated in corn fields in northwest, north central, central, northeastern, and southeastern IA; southern MN, southwest and southern WI; northern-central and northwestern IL; central and eastern NE; and southwestern Ontario. (Figure 4, right).
- In comparison to 2023 CRW forecast (Figure 4, left), the risk for 2024 (Figure 4, right) appears to be reduced in Iowa but expanded in northern Illinois, Wisconsin, and Ontario.
- Larval populations in 2023 are estimated to be relatively low in many parts of ND, SD, MN, NE, KS, MO, IL, IN, MI, and KY; however, localized hot spots can be found every year (Figure 4).



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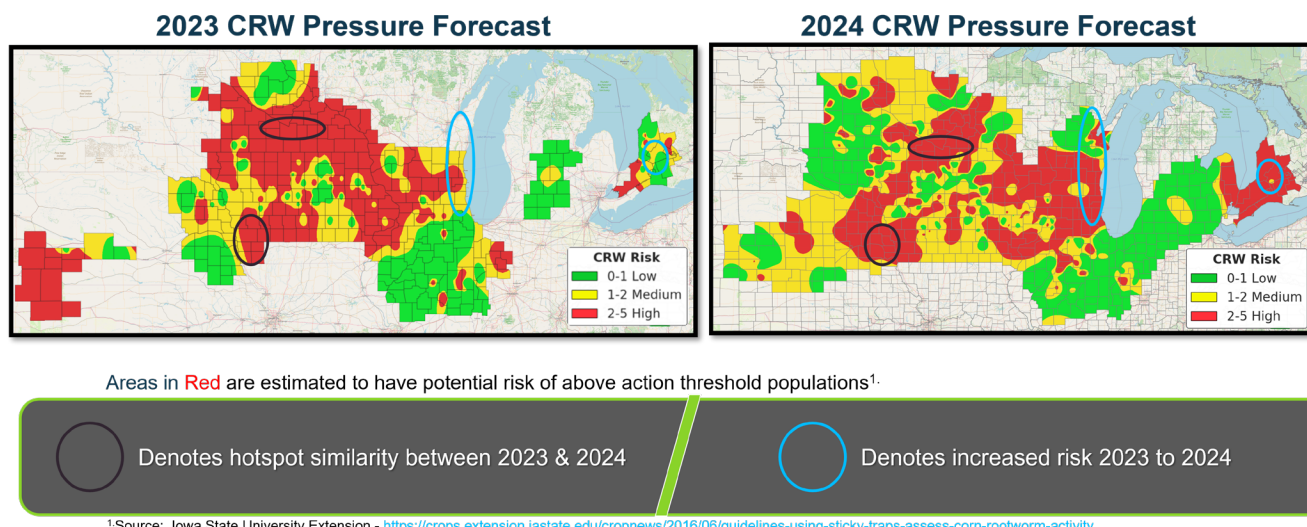


Figure 4. Comparison of 2023 and 2024 corn rootworm (CRW) risk forecasts based on 2022 (562 fields) and 2023 (904 fields) CRW beetle monitoring. Fields were in CO, IA, IL, IN, KS, MI, MN, MO, NE, ND, KY, SD, and WI in 2022 and CO, IA, IL, IN, KS, MI, MN, MO, NE, ND, OH, SD, WI, and Ontario, Canada in 2023.

Key Learnings

- Corn root injury from CRW larvae is a persistent and annual threat to yield and profit potential, making CRW a pest that cannot be ignored. University research has demonstrated that even a moderate level of CRW larval feeding can cause yield losses averaging 15%, with losses of 45% or more being possible.³
- In the absence of site-specific data, local and regional CRW beetle 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 larval potential. This information can be used to help prepare for the 2024 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 yield potential.

Sources:

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

²Hodgson, E. and Gassmann, A.J. 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-using-sticky-traps-assess-corn-rootworm-activity>.

³Tinsley, 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. Department of Crop Sciences, University of Illinois, Urbana, IL. Journal of Applied Entomology 137(3): 161-169. <https://doi.org/10.1111/j.1439-0418.2012.01736.x>.



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Legal Statements

The information discussed in this report is from a multiple site, non-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.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Performance may vary, from location to location and from year to year, as local growing, soil and environmental conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on their growing environment.

The recommendations in this material are based upon trial observations and feedback received from a limited number of growers and growing environments. These recommendations should be considered as one reference point and should not be substituted for the professional opinion of agronomists, entomologists or other relevant experts evaluating specific conditions.

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