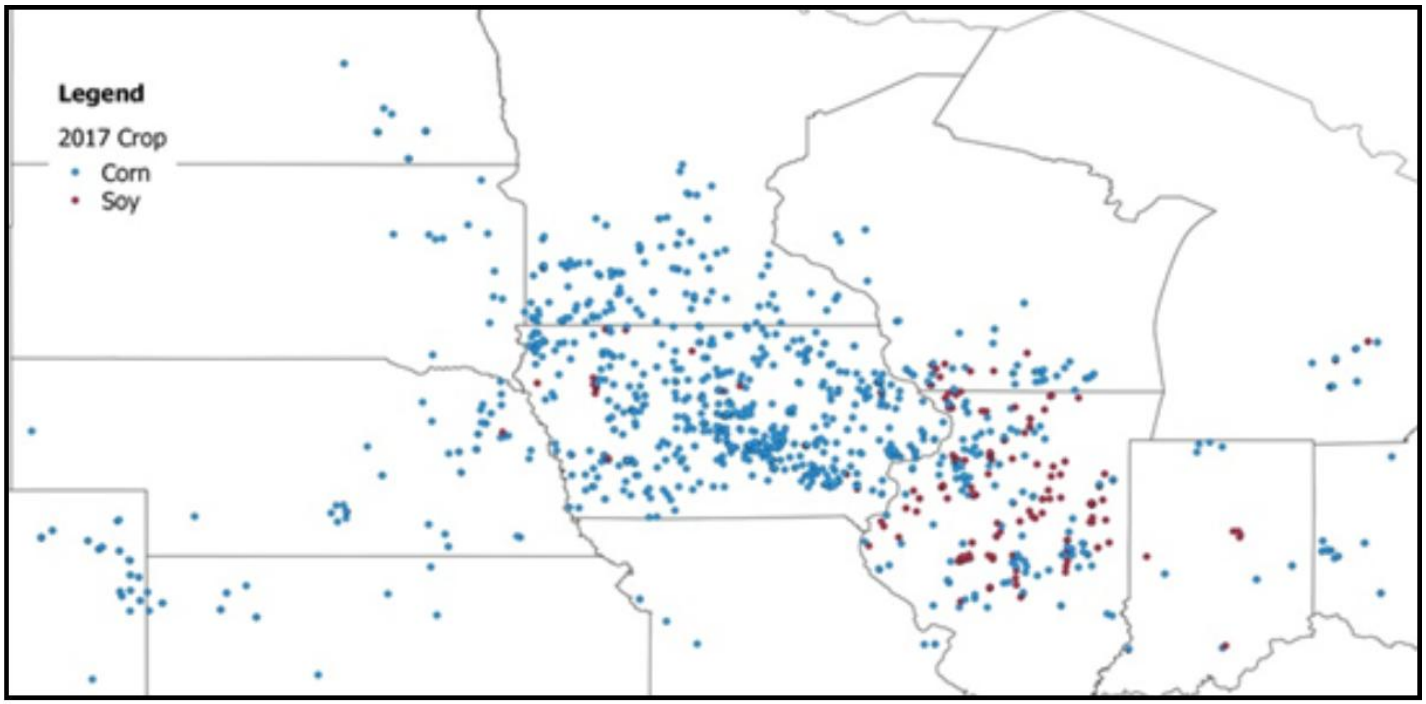
USING 2017 CORN ROOTWORM BEETLE COUNTS TO HELP EVALUATE THE RISK OF AN INFESTATION FOR 2018

TRIAL OVERVIEW

- The 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 infestation reaching economic damage levels in corn fields during the next growing season.
- Use of this information may help guide decisions regarding management strategies including corn product selection.



2017 Crop	Previous Crop	Number of Sampled Fields	Average Peak Number of Beetles/Trap/Day		
			Northern Corn Rootworm	Western Corn Rootworm	Total
Corn	Corn	381	0.27	3.85	4.11
Corn	Rotated	386	0.28	0.46	0.74
Corn	Not Specified	520	0.05	1.26	1.30
Total Corn	All Rotations	1287	0.18	1.78	1.97
Soybean	Corn	208	0.02	0.40	0.42
Corn and Soybean	**All Rotations**	**1495**	**0.16**	**1.59**	**1.75**

Figure 1. Location of 2017 corn rootworm beetle (CRW) monitoring fields by crop (top) and characterization of 2017 sampled fields by present crop and previous crop with average maximum daily captures for western (WCR) and northern (NCR) CRW beetles (bottom).

RESEARCH OBJECTIVE

- The objective of this project was to measure adult corn rootworm population levels in corn and soybean fields in 2017 to assist in risk evaluation for 2018.

Location	Soil	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield/Acre	Planting Rate/Acre
1495 Fields	Drained or Well Drained	See Figure 1	Conventional			110 - 250 bu/acre	28 - 36,000 seeds/acre

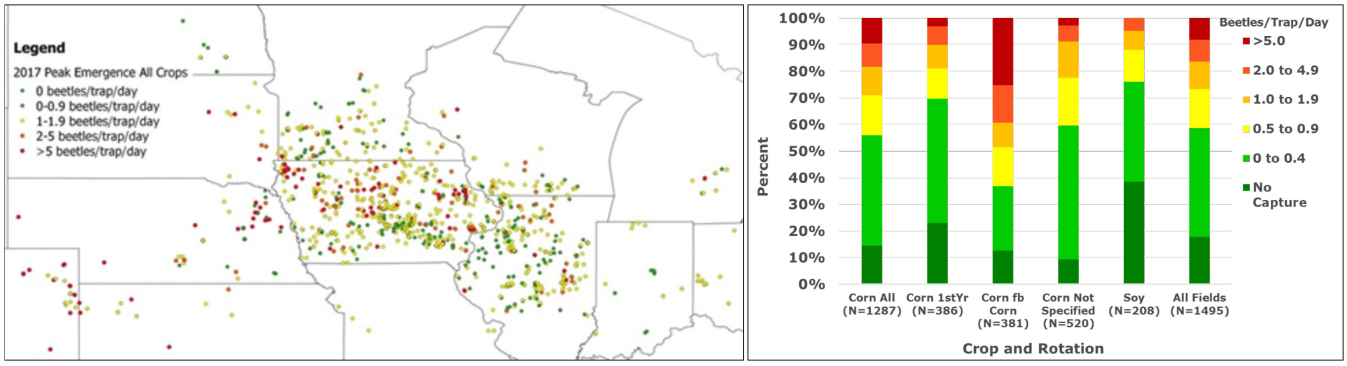


Figure 2. (Top Left) Corn rootworm (CRW) beetle monitoring locations for 2017 categorized by peak beetle counts observed during sampling and (Right) peak beetle emergence frequency categories (beetles/trap/day) observed in 2017 CRW monitoring fields by crop and rotation.

SITE NOTES:

- One to four Pherocon® AM non-baited trapping sites were established at 1495 field locations across the corn growing areas of IA, IL, IN, OH, MI, WI, MN, ND, SD, NE, KS, MO, and CO (Figure 1, Top).
- The trapping sites were installed in the interiors of corn and soybean fields that encompassed a variety of crop and management histories (Figure 1, Bottom).
- The Pherocon® AM traps were refreshed at 5-10 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 (NCRW) and western (WCRW) 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 maximum capture value for each field was determined and the data were used in further analysis.

UNDERSTANDING THE RESULTS

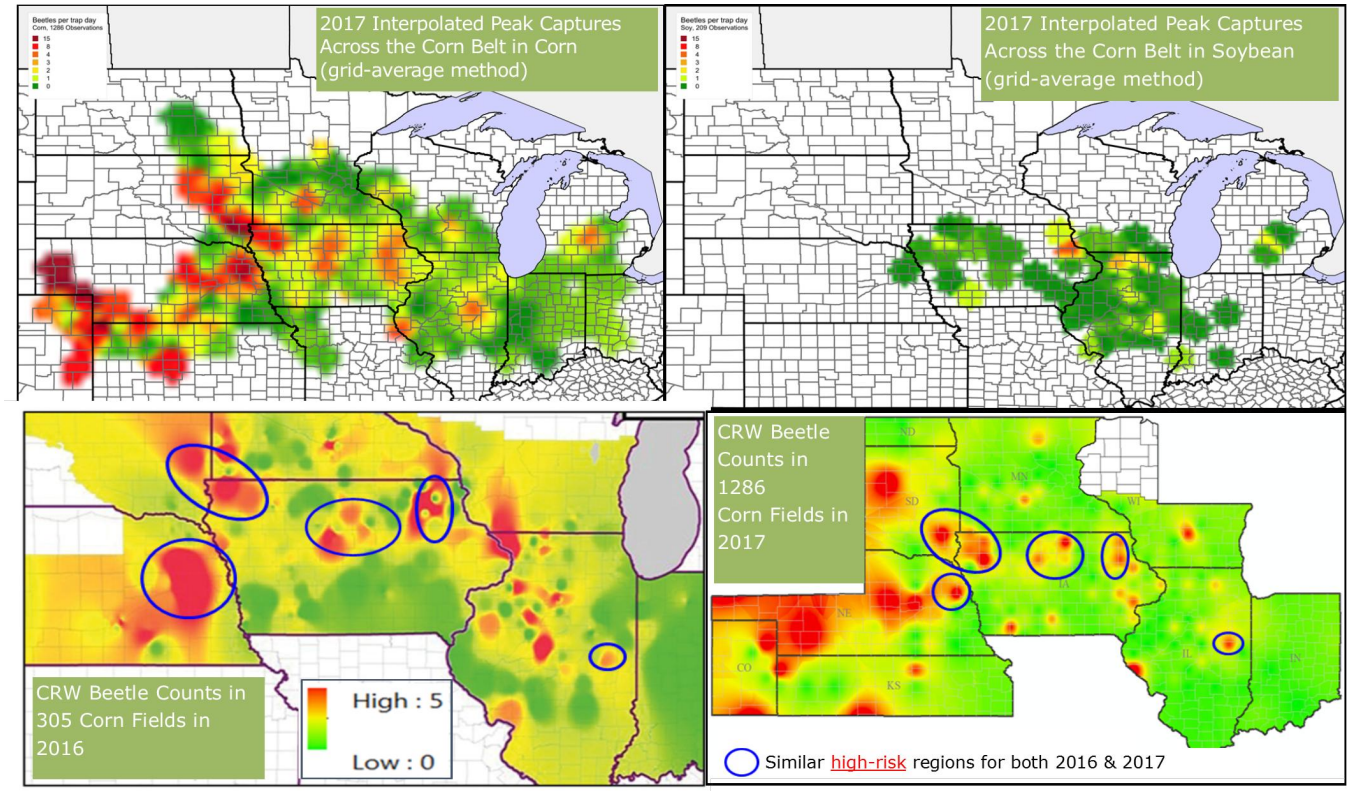


Figure 3. 2017 Interpolated peak beetle captures across the Corn Belt in corn (Top Left) and in soybean (Top Right). Comparison of 2016 (Bottom Left) and 2017 (Bottom Right) CRW beetle captures in corn. (Circled areas represent similar areas of higher CRW populations in 2016 and 2017).

- Categories for CRW beetle counts are based on action thresholds (beetles/trap/day) suggested by Extension entomologists at the Universities of Illinois and Iowa State and provide economic damage (ED) potential for the following season.[1,2]
  - Less than 2 beetles indicate a low risk of ED.
  - Greater than 1 beetle suggests a low risk for ED but could indicate populations are increasing.
  - Greater than 2 beetles indicate ED probability is likely if control measures are not used.
    - Control measures include CRW *Bacillus thuringiensis* (*B.t.*) protected corn products or soil-applied insecticides.
  - Greater than 5 beetles indicate ED is very likely and populations are expected to be very high.
- 2017 CRW Beetle Survey Data (Figure 2, Left and Right).
  - Populations were variable across the corn area (Figure 2, Left).
    - Suggests that environment and management are factors in determining CRW pressure levels.
  - 19% of corn fields had counts exceeding the threshold of 2 beetles/trap/day.
  - 11% of the corn fields were approaching threshold levels (Figure 2, Right).
  - Corn fb corn had higher avg. max. daily counts than 1st-year corn (4.7 vs. 0.74 beetles/trap/day (Figure 1, Table).
  - 39% of continuous corn fields exceeded the threshold (Figure 2, Right).
  - Counts from soybean fields in IL and E IA were low (0.42 beetles/trap/day) (Figure 1, Table).
  - The threshold was exceeded in 5% of all soybean fields sampled (Figure 2, Right).
  - Counts of 0 were recorded in 14% and 38% of corn and soybean fields, respectively (Figure 2, Right).
- 2017 Data Interpolation (Figure 3, Top Right and Left).
  - 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 systematic grid applied to the estimation area.
  - On a broad scale, CRW populations, and consequently, risk potential is elevated in corn fields across E and SW NE, NE CO, W KS, SE SD, as well as NW, C, and EC IA.
  - Corn rootworm populations continue to be relatively low in many parts of ND, MO, IL, and S WI; however, localized hot spots can be found every year.
  - Notable CRW beetle presence in soybean fields was isolated to small areas in NC IL and NE IA.
- Comparison of 2016 vs. 2017 CRW Beetle Data (Figure 3, Bottom).
  - Absolute comparisons between 2016 and 2017 populations should be made with low confidence due to large differences in sampling intensity and distribution. However, trends may still be reliably identified.
  - Areas with large populations (i.e. "hot spots") are consistent from year to year. Populations appear to have grown in some areas (e.g. IA) while dissipating in others (e.g. portions of IL and S WI).

WHAT DOES THIS MEAN FOR YOUR FARM?

- Corn rootworms pose a significant threat to yield and profit, 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 up to 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. Use this information to help prepare for the 2018 season by selecting *B.t.* protected corn products to protect your risk of CRW larvae damaging roots the following year.

SOURCES
1 Western corn rootworm. Diabrotica virgiferavirgifera 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-using-sticky-traps-assess-corn-rootworm-activity.
3 Evaluating corn rootworm risk and economic impact. 2017. Agronomic Spotlight. Monsanto Company. Websites verified 11/9/17. 171106192900