2024 FINAL REPORT (project ogoing)

PROJECT TITLE: Enhancement of Survey Efforts for Corn Insect Pests in Minnesota in 2024
PROJECT NUMBER: 6124-24DD
REPORTING PERIOD: 08/01/2024-02/28/2025
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1.) PROJECT ACTIVITIES COMPLETED DURING THE REPORTING PERIOD. (*Describe project progress specific to goals, objectives, and deliverables identified in the project workplan.*)

Objective 1: Improve and expand the current trapping networks for corn insect pests.

The Blacklight trap Monitoring Network continued in 2024 with four locations: Rosemount (Dakota), Lamberton (Redwood), Blue Earth (Faribault), and Dodge Center (Dodge). Traps were set up and checked daily beginning May 15th to monitor moth populations of true armyworm, western bean cutworm, corn earworm, and European corn borer across the state throughout summer.

The Minnesota Pheromone Trap Network continued in 2024 with 2-7 locations: Rosemount (Dakota), Lamberton (Redwood), Blue Earth (Faribault), Dodge Center (Dodge), Blooming Prairie (Steele), Waltham (Mower), and LMFF. Traps were set up and checked weekly to monitor moth populations of true armyworm, corn earworm, and European corn borer across the state throughout the summer. Data was summarized weekly and uploaded to the website- VegEdge, hosted by the College of Food Agriculture and Natural Resources, at the University of Minnesota.

The Minnesota Yellow Sticky Trap Network continued in 2024 with approximately 200 fields. Yellow sticky cards were shipped to the cooperators early in the season, deployed and the field data was collected by the collaborators. The data was summarized at the end of summer season.

Objective 2: On-farm survey plots for corn insect pests will primarily begin in late summer and the fall of 2024.

European corn borer (ECB) survey data collection started in late September and continued into October. For the ECB survey, requests went out to growers through MN Crop News, Minnesota Corn Growers Association, and local extension contacts for known non-Bt fields.

During 2024, 143 randomly selected commercial fields and 40 volunteered non-Bt fields were evaluated for the presence of overwintering ECB larvae. Collaborators made 10 stops per field along a transect. ~30 feet between stops as they walked further into the field along a row with no stops within 30 feet of a field edge until at least 10 plants were sampled. Cooperators also examined each plant for signs of disease, including stalk rot and tar spot.

2.) IDENTIFY ANY SIGNIFICANT FINDINGS AND RESULTS OF THE PROJECT TO DATE.

Objective 1

Ia) Black light trap network.
Graphs summarizing blacklight trap moth flight were posted weekly to the VegEdge web site (https://vegedge.umn.edu/weekly-moth-flights).

True armyworm. Based on blacklight trap data and grower calls, true armyworm (TAW) continues to emerge as a more frequent pest, perhaps in response to changes in cropping practices. As expected, reports of true armyworm issues began surfacing since the deployment of blacklight traps in May. TAW larvae primarily feed on grasses and grass crops, with dense grassy weeds, lodged grasses, small grains, and winter cereals serving as preferred egg-laying sites. This spring, winter cereals and grasses have grown particularly lush, with lodging already observed in some areas, creating optimal conditions for egg deposition. Additionally, starving larvae were occasionally observed feeding on soybeans and other broadleaf crops when rye cover was terminated. In our survey locations, the first population peak was recorded in early June in Lamberton, with trap counts reaching about 35 moths per trap per night (Fig. 1). The population then remained moderate yet persistent throughout the season, with a second peak in mid-to-late July and activity extending into September. Given these trends, grass around cornfields may serve as a key early breeding site, making regular scouting essential for timely pest management.

European corn borer. The moth flight for this species remains at 'ultra-low' levels across all MN locations, compared to historical data (>20 yrs ago). The univoltine (single generation/yr) strain of ECB, that has historically been the most prevalent in NW MN, continues to be found in the southern regions of the state. Moths captured in late July can typically be estimated to be univoltine, as they require more degree-days (heat units) to emerge in spring and complete their development, compared to the bivoltine (2 gen/yr) strain. Two sites reported moth capture in July, with Dodge recording up to 6 moths per trap per night (Fig. 2). By mid to late August, when a second generation of multivoltine adults would typically emerge, Dodge recorded a maximum of only 4 moths per trap per night. Despite the low populations of ECB, Dodge remains a site worthy of continued monitoring in future years.

Corn earworm. This year, corn earworm (CEW) flights were exceptionally low across Minnesota this year, indicating an unusually weak migration season (Fig. 3). In Blue Earth, CEW flights adhered to the typical mid-August to September pattern but were recorded at lower levels compared to previous years, with the highest capture reaching only 10 moths per trap per night. Despite this overall low activity, grower reports suggest an earlier-than-usual CEW arrival in

Minnesota's sweet corn fields. In Dodge, moths were first detected in July, with captures continuing into early September; the highest flight activity occurred in late August, with trap counts reaching up to 12 moths per trap per night.

Western bean cutworm. Western bean cutworm (WBC) populations in the northeastern part of Minnesota have historically remained at very low levels. However, this year has seen a notable increase in their populations compared to previous seasons (Fig. 4). WBC moth activity was first detected in late May, with trap captures in Lamberton reaching as high as 40 moths per trap per night. Throughout July and August, WBC populations in both Rosemount and Lamberton were in their peak activity phase, with trap captures in Lamberton reaching a peak of over 50 moths per night during this period. It remains uncertain whether these moths were produced locally or transported by winds from more heavily infested areas to the south. Late-tasseled fields are expected to be particularly attractive to egg-laying moths; therefore, scouting for egg masses during early rootworm scouting efforts is recommended. Continued monitoring and proactive management will be crucial in the upcoming season to prevent potential infestations.

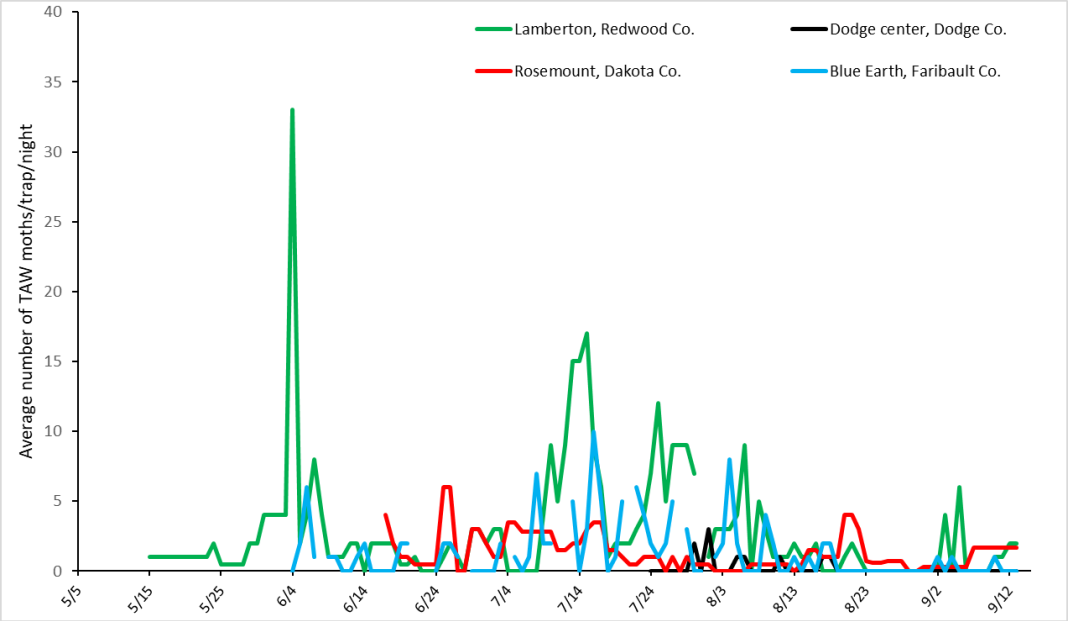

Figure 1. True armyworm flight recorded from blacklight trap cooperators in 2024 through September. https://vegedge.umn.edu/weekly-moth-flights

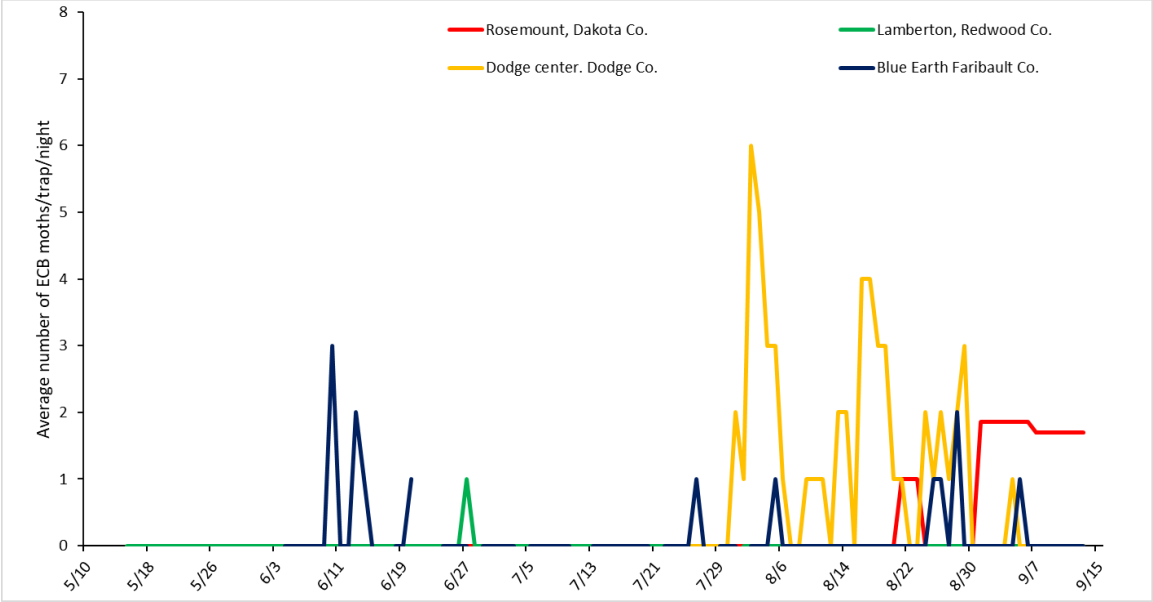

Figure 2. European corn borer flight recorded from blacklight trap cooperators in 2024 through September. https://vegedge.umn.edu/weekly-moth-flights

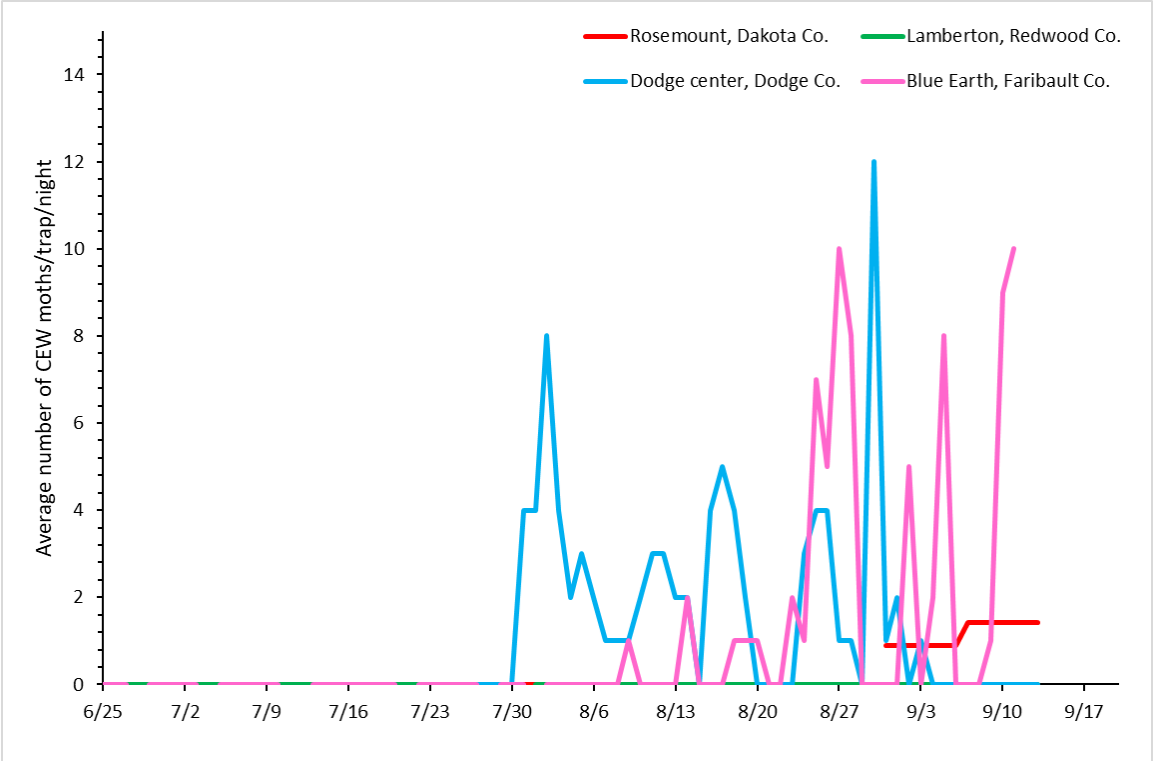

Figure 3. Corn earworm flight recorded from blacklight trap cooperators in 2024 through September. https://vegedge.umn.edu/weekly-moth-flights

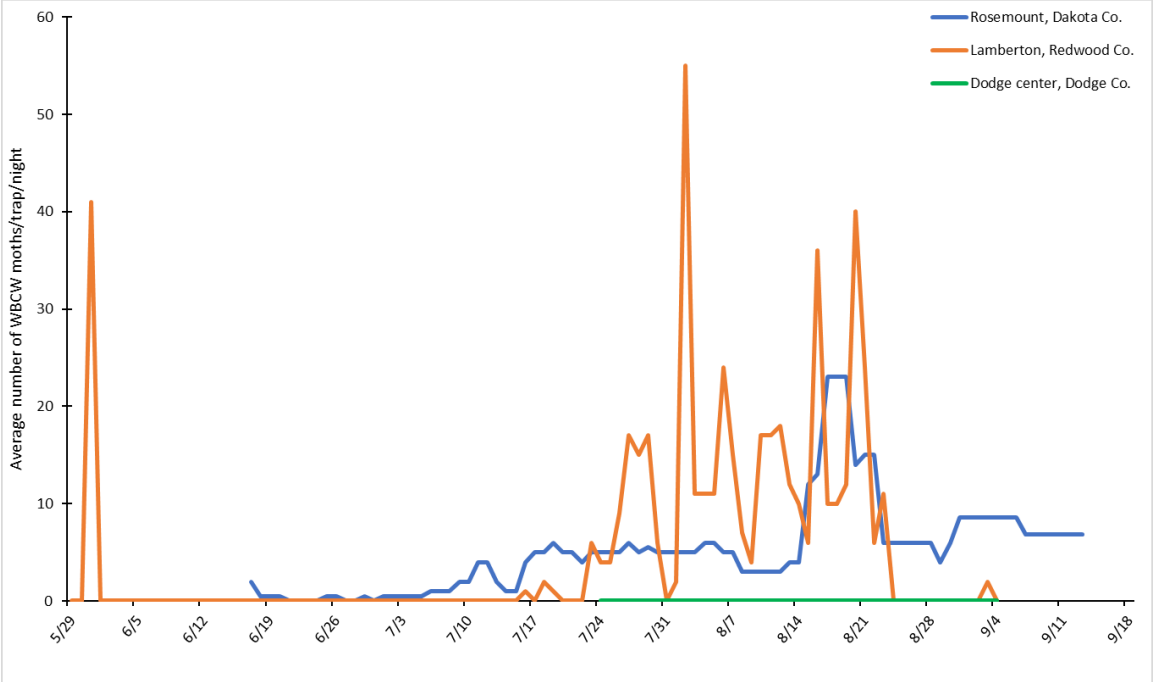

Figure 4. Western bean cutworm flight recorded from blacklight trap cooperators in 2024 through September. https://vegedge.umn.edu/weekly-moth-flights

Ib) Pheromone trap network

True armyworm. Pheromone traps picked up the 1st true armyworm (TAW) moths of the season on April 18, with two TAW moths captured in a Blue Earth trap. TAW migration detected in pheromone traps remained very low throughout April and early May. Although not yet at the levels that triggered problems in 2023, armyworm moth migration increased in mid-May. It was reported that pheromone traps in Roseau County recorded high moth counts (17-28/trap) in grass seed production fields in mid-May, likely aided by a weather system went through the northwest corner of Minnesota. Early-season rainfall has fostered lush grass growth and an abundance of small grains, creating optimal egg-laying habitats for incoming moths.

European corn borer. Based on pheromone trap data (Fig. 5), European corn borer populations appear to be low across the landscape. All captured moths in Minnesota should belong to Z-strain.

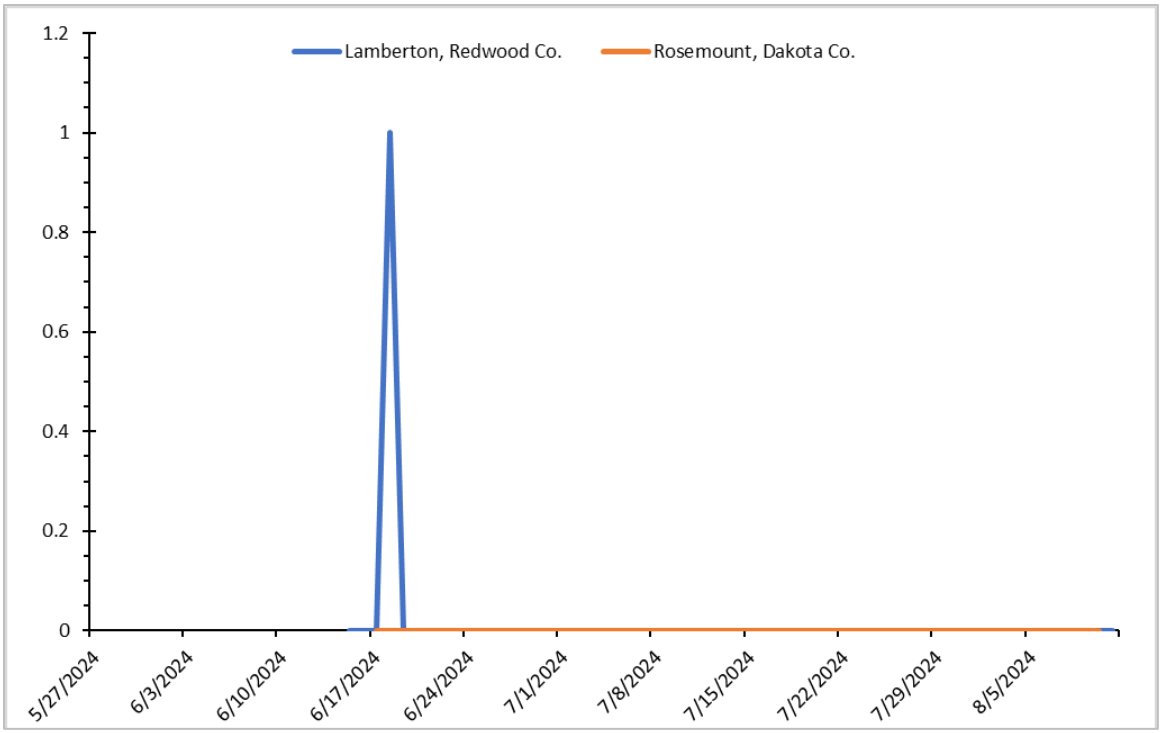

Figure 5. European corn borer moth (E-strain) recorded from pheromone trap cooperators in 2024.

Ic) Corn rootworm sticky trap network.

A survey of 254 sites across Minnesota revealed that corn rootworm (CRW) populations were higher in non-Bt fields compared to Bt fields (Table 1). In the first-year corn fields, corn rootworm populations were significantly less than those in continuous corn fields, regardless of Bt or non-Bt fields (Table 1). Crop rotation significantly reduced WCR populations, whereas some NCR populations exhibited resistance to rotation, maintaining its presence even in some rotated corn fields (Table 1). The overall western corn rootworm (WCR) population was higher than the population of northern corn rootworm (NCR) across the state. In the 156 selected sites across southern Minnesota, corn rootworm (CRW) populations were also higher in non-Bt fields compared to Bt fields (Table 2). In Bt corn fields, corn rootworm populations were significantly less for the first-year corn than those for continuous corn (Table 2). As the duration of continuous corn planting increased, western corn rootworm (WCR) infestation became more dominant. This trend was particularly evident in fields with three or more consecutive years of corn, where WCR populations significantly exceeded those of NCR (Table 2). In some first year non-Bt corn fields, NCR populations were significantly higher than the WCR, and also significantly higher than the populations in the 2nd year and >3 years continuous corn fields, suggesting the rotation resistance in NCR, where eggs displayed extended diapause (Table 2).

Table 1. Corn rootworm from yellow sticky trap cooperators in all MN sites in 2024

Bt RW trait	Rotated	Number of fields	Beetles/Trap/Day (highest week's capture)			
			WCR	NCR	All RW	%WCR
Yes	Yes	53	0.1	0.2	0.3	33.33
	No	88	1.1	0.2	1.3	84.62
	All	141	1.2	0.4	1.6	75.00
No	Yes	105	0.1	0.1	0.2	50.00
	No	8	0.5	0.2	0.7	71.43
	All	113	0.6	0.3	0.9	66.672
Overall	All	254	1.8	0.7	2.5	72.00

Table 2. Corn rootworm from yellow sticky trap cooperators in selected Southern MN sites in 2024

Bt RW trait	Number years corn	Number of fields	Beetles/Trap/Day (highest week's capture)			
			WCR	NCR	All RW	%WCR
Yes	1	43	0.1	0.2	0.3	33.33
	2	27	0.2	0.5	0.7	28.57
	⩾3	33	2.3	0.3	2.6	88.46
	All	103	2.6	1.0	3.6	72.22
No	1	48	0.2	1.8	2.0	10.00
	2	3	0.9	0.3	1.2	75.00
	⩾3	2	3.0	0.3	3.3	90.91
	All	53	4.1	2.4	6.5	63.08
Overall	All	156	6.7	3.4	10.1	66.34

Objective 2

Fall overwintering larval population densities were somewhat lower in 2024 compared to previous years while finds continue to be found in the central and NW region of the state. Overall, 2024 ECB population levels were similar to those in 2017-2023 and remained at historically low levels averaging 0.0011 larvae/plant (Fig. 7).

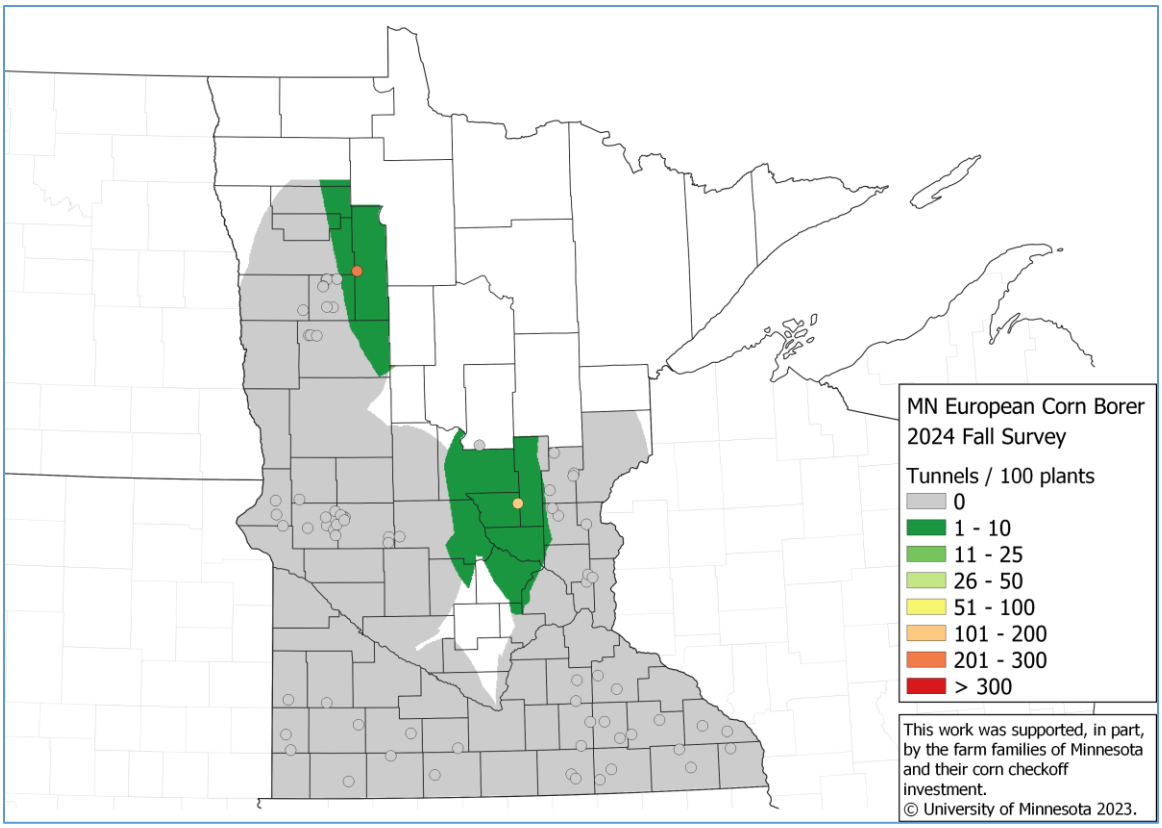

Figure 7. 2024 fall survey of European corn borer. Symbols are the approximate field location for randomly selected fields (primarily Bt) and volunteered known non-Bt sites with symbol coloring representing the actual number of ECB tunnels found. The coloring between sites is interpolated estimates of pest pressure between sites.

3.) CHALLENGES ENCOUNTERED. (*Describe any challenges that you encountered related to project progress specific to goals, objectives, and deliverables identified in the project workplan.*)
No challenges were found during this period.

4.) FINANCIAL INFORMATION (*Describe any budget challenges and provide specific reasons for deviations from the projected project spending.*)
One postdoc and one Extension IPM specialist working on this project left the position during the project year, and new hires were initiated. We may need to do the re-budget and budget extension.

5.) EDUCATION AND OUTREACH ACTIVITES. *(Describe any conferences, workshops, field days, etc attended, number of contacts at each event, and/or publications developed to disseminate project results.)*

1. Aspects of this project have been discussed in the SW IPM Stuff newsletter. https://swroc.cfans.umn.edu/sw-mn-ipm-stuff-newsletters
2. Black Cutworm Reporting Network. https://swroc.cfans.umn.edu/research/ipm/bcw-network.
3. Hanson, A., **Yang, F.,** Hutchsion, B., Potter, B., Peltier, A., Miller, R., Stahl, L., 2024. Reducing Bt trait acres in 2024 Minnesota Corn Production? Implications for European corn borer. MN Crop News, https://blog-crop-news.extension.umn.edu/2024/03/reducing-bt-trait-acres-in-2024.html

4. Peltier, A., **Yang, F.,** Potter, B., Koch, R., 2024. Field Notes session talks insect management considerations for soggy fields. MN Crop News, https://blog-crop-news.extension.umn.edu/2024/07/field-notes-session-talks-insect.html
5. Stahl, L., **Yang, F.,** 2024. Strategic Farming: Let's talk crops focused on corn insect pests. MN Crop News, https://blog-crop-news.extension.umn.edu/2024/03/strategic-farming-lets-talk-crops_18.html
6. Wang, Y., **Yang, F.,** 2024. First detection of corn leafhopper in Minnesota in 2024. MN Crop News, https://blog-crop-news.extension.umn.edu/2024/10/first-detection-of-corn-leafhopper-in.html
7. Wangila, D., Yang, F., 2024. Scouting for corn rootworm. MN Crop News, https://blog-crop-news.extension.umn.edu/2024/08/scouting-for-corn-rootworm.html
8. **Yang, F.,** 2024. Field School for Ag Professionals. "Identification of pest & beneficial insects in field crops". July 30th, 2024.
9. **Yang, F.,** 2024. Management of corn insect pests: foliar & soil insecticides and seed treatment. 2024 CPM Short Course and MCPR Trade Show. Dec. 10-12th, Minneapolis, MN.
10. **Yang, F.,** 2025. Corn Rootworm Management & Foliar Insect Update. 2025 MNICCA Conference, Feb. 19th, St. Cloud, MN.
11. **Yang, F.,** 2025. Strategic Farming: Keeping track of changes in corn insect challenges. Feb. 26th, 2025, Webinar.
12. **Yang, F.,** Dwyer, T., Wangila, D., 2024. Scouting for European corn borer infestations. MN Crop News, https://blog-crop-news.extension.umn.edu/2024/08/scouting-for-european-corn-borer.
13. **Yang, F.,** Potter, B. 2024. Scouting & decision making for corn rootworms & European corn borer. UMN Field School for Ag Professionals, July 31, 2024.
14. **Yang, F..,** 2024. Management and Competition of Western and Northern Corn Rootworm. UMN Field day August 7, 2024, Rosemount ROC Advisory Committee Summer Research Tour.